Chapter 5
Effects of the Covered Activities

5.1 Introduction and Approach

The LCR MSCP BA impact assessment describes the effects on covered species and critical habitat from implementing the covered activities described in Chapter 2, and Chapter 3 and the LCR MSCP Conservation Plan described in Chapter 5 of the LCR MSCP HCP. The effects of implementing the covered activities and the LCR MSCP Conservation Plan are compared against baseline conditions described in Chapter 4. The focus of the impact assessment is to identify effects of the covered activities and the LCR MSCP conservation measures on covered and evaluation species and their habitats.

The LCR MSCP BA impact assessment is a stepwise process and analyzes the effects of flow-related covered activities, non-flow-related covered activities, and the combined indirect effects of ongoing OM&R flow-related and non-flow-related covered activities on covered species. First, the impact mechanisms are described for flow-related and non-flow-related covered activities and LCR MSCP conservation measures, and broad changes in environmental conditions are described. Second, the responses of species and species habitat to the impact mechanisms are described.

Implementation of the covered activities and LCR MSCP conservation measures could result in the incidental take (take) of all covered species. When applicable, the level of incidental take and changes in critical habitat are identified. The quantification of effects on habitat is limited by the information available for each species. Where information on a covered species' occupied habitat is not available, the assumed effect is the degradation or loss of all the acreage of the land cover types that are assumed to provide habitat for the species (see Section 4.6.2.1). This "worst-case" assumption is a conservative approach that results in an overestimation of the actual effects on the species.

5.2 Assessment of Flow-Related Covered Activities on Hydrologic Conditions

Flow-related covered activities are described in Chapter 2, "Description of Federal Actions (Covered Activities)," and non-Federal flow-related covered activities are described in Chapter 3, "Non-Federal Covered Activities: Ongoing and Future." There are two categories of flow-related activities: 1) ongoing water deliveries, diversions, and

returns of 7.5 mafy and surplus water, and 2) total future changes in points of diversion, including shortages, of 1.574 mafy and shortage. Reclamation has completed hydrologic modeling and subsequent analysis of habitat impacts associated with these flow-related covered activities. The purpose of the model was to provide information regarding the changes to hydrologic conditions from flow-related covered activities to river surface elevations, reservoir elevations, and groundwater levels. This information was then applied in the subsequent steps to identify how changes in hydrologic conditions would affect habitat. Issues addressed through the modeling include:

- How impacts to groundwater, marsh and backwater may result from lower river surface elevations caused by changes in point of diversion. Changes to groundwater elevation in the floodplain may result in effects to the overlying vegetation and to backwaters and associated marsh that are not directly connected to the river by a surface connection. Changes in daily low river surface elevation may result in effects to backwaters and associated marsh that are directly connected to the river by a surface connection.
- How impacts to habitats associated with Lake Mead surface elevations may result from the probability of lower surface elevations caused by implementing future surplus and shortage criteria. Changes in Lake Mead surface elevations may result in effects to the aquatic environment in Lake Mead and vegetation communities around and near the lake shore.
- Possible reductions in beneficial flows past Morelos Diversion Dam into Reach 7. This reduction in beneficial flows may result from lower Lake Mead surface elevations reducing the probability of flood flow releases.

Information developed from existing Reclamation BAs and USFWS BOs has been incorporated as applicable (Bureau of Reclamation 1996, 2000a; U.S. Fish and Wildlife Service 1997, 2001). The effects of Federal flow-related activities addressed in the LCR MSCP BA cannot be separated from the effects of non-Federal flow-related activities addressed in the LCR MSCP HCP. Therefore, the impact analysis for flow-related activities encompasses both Federal and non-Federal flow-related activities, and the analysis and results are the same in the LCR MSCP BA and the LCR MSCP HCP.

The LCR MSCP analyzes and provides mitigation for the potential impacts resulting from changes in point of diversion and consequent annual reductions in flow totaling 1.574 mafy on the 27 covered species. As described in Chapter 4, Reclamation and USFWS completed a section 7 consultation in 2001 regarding potential effects to Yuma clapper rail, southwestern willow flycatcher, bonytail, and razorback sucker from operations under ISC through 2016 and a change in point of diversion totaling 400,000 afy. This change in point of diversion is being included for coverage under the LCR MSCP as part of the 1.574 mafy total. This BA relies on the ISC/SIA BO for the analysis of potential effects to Yuma clapper rail, southwestern willow flycatcher, bonytail, and razorback sucker from the 400,000 afy changes in point of diversion. Accordingly, this BA analyzes the effect of additional changes in point of diversion of 1.174 mafy on these four species. For the remaining 23 species, however, this BA provides an analysis of the effects resulting from the total annual flow reduction of 1.574 mafy. Although the LCR MSCP does not supersede the ISC/SIA BO, the effects of the 400,000 afy and accompanying conservation measures will be credited in the Conservation Plan for the LCR MSCP. The LCR MSCP conservation measures (see

Chapter 5 of the LCR MSCP HCP) will provide coverage for all 27 covered species identified in the LCR MSCP.

This section describes the methods used to model the hydrological effects of the flow-related covered activities on surface water and groundwater (see Section 5.2.1); results of the hydrological modeling (see Section 5.2.2); the key assumptions used along with the modeling results to conduct the analysis of impacts of flow-related covered activities on covered species (see Section 5.2.3.1); and the subsequent potential effects of hydrologic changes as indicated in the modeling results on habitat conditions (see Sections 5.2.3.2 to 5.2.3.6).

5.2.1 Methods and Assumptions

This section describes the methodologies used to analyze effects to habitats for covered species from flow related covered activities. A detailed description of the hydrologic modeling and the assumptions used to conduct the analysis of effects of flow-related covered activities is presented in Appendix J, "Technical Documentation of Ongoing and Future Operations." Two different hydrologic models were utilized in carrying out the analysis of effects. The first, described in Section 5.2.1.1 below and in Appendix J (Section J.6.1) was used to determine the effect of the flow-related covered actions on Lake Mead water surface elevations and the resulting potential effect on flows in Reach 7. The second, described in Section 5.2.1.2 below and in Appendix J (Section J.6.2), was used to determine the effect to the river corridor based on reduced releases from Davis and Parker Dams.

The terms "Baseline scenario" and "Action Alternative scenario" are used throughout this section to facilitate the comparison between the detailed information presented in Appendix J as summarized in the following sections. The term "Baseline scenario" represents the modeling scenario for continuing operations in the future without the implementation of future flow-related covered activities. The term "Action Alternative scenario" is the modeling scenario for future conditions with implementation of future flow-related covered activities[1].

5.2.1.1 Description of Colorado River System Simulation Hydrologic Model

Reservoir elevations may be affected by implementation of the flow-related covered activities. However, water elevations within Lake Mohave (i.e., Reach 2), Lake Havasu, Senator Wash Reservoir, and the relatively small reservoirs including Senator Wash Reservoir and those behind Headgate Rock, Palo Verde Diversion, Imperial, Laguna, and Morelos Diversion Dams will continue to be maintained to meet water diversion and other operational objectives. Consequently, the variability in storage and water surface

[1] The use of the phrase "Baseline scenario" in this BA and the LCR MSCP HCP regarding hydrologic modeling refers to the current operations of the LCR and should not be confused with the definition of "baseline" as used in the ESA regulations or CEQA. Similarly, the use of the phrase "Action Alternative scenario" in this BA and the LCR MSCP HCP regarding hydrologic modeling refers to the future operations of the LCR. See Appendix J for further details on the modeling assumptions.

elevation maintained by these dams with the future flow-related covered activities will be the same as under existing conditions.

Effects on Lake Mead (Reach 1) elevations were modeled using a commercial river modeling software called RiverWare (Bureau of Reclamation 2000c). RiverWare was developed by the University of Colorado through a cooperative process with Reclamation and the Tennessee Valley Authority. RiverWare is configured to simulate the Colorado River System and its operation and integrates the Colorado River Simulation System model that was developed by Reclamation in the early 1970s. River operation parameters modeled and analyzed includes the quantity of water entering the river system, storage in system reservoirs, releases from storage, river flows, and the water demands of and deliveries to the Upper and Lower Division States and Mexico. Flows in Reach 7 below Morelos Diversion Dam are primarily the result of flood control releases from Hoover Dam. These releases are directly affected by Lake Mead elevations and therefore the effects in Reach 7 are analyzed using the RiverWare model. Results of the modeling of effects on Lake Mead are described in Section 5.2.2.1 and on Reach 7 in Section 5.2.2.2.

To assess the potential hydrologic impacts on Reaches 1 and 7 from implementation of the flow-related covered activities, the modeling was conducted to identify changes in hydrologic conditions with and without future flow-related activities. The first model scenario, called the Baseline scenario, models river operations through 2051. In addition to the continuation of the ongoing operations conducted by Reclamation on an annual basis, this scenario also assumes: 1) transfers of up to 400,000 af annually from below to above Parker Dam by 2051, 2) Interim Surplus Guidelines (ISG) remain in place through 2016 and then revert back to previously used spill-avoidance guidelines, and 3) shortage assumptions as described in Appendix J.

To assess the potential changes to hydrological conditions from implementation of future flow-related covered activities a second modeling scenario was conducted. This scenario incorporates the future flow-related covered activities, described in Chapters 2 of the LCR MSCP BA and HCP, including: 1) 1.574 mafy of transfers by 2051, 2) extension of the ISG through 2051, and 3) modified shortage assumptions as described in Chapter 2 of this BA and in Appendix J. In Appendix J, this modeled scenario is called the Action Alternative scenario. The water supply used in the modeled scenarios consists of the historical record of natural flow from 29 individual inflow points in the river system over the 85-year period from 1906 to 1990[2]. Future hydrology was generated from 85 simulations of historical natural flows using the Index Sequential Method (Bureau of Reclamation 2000c). Starting conditions for all system reservoirs are based on actual

[2] Public comments received during the comment period for the LCR MSCP Draft EIS/EIR, Draft BA, and Draft HCP noted that the modeling conducted by Reclamation for the LCR MSCP relied on hydrologic data that does not reflect the recent dry conditions in the Colorado River Basin. The comments suggested that because of the change in hydrologic conditions, the modeled results underestimate the magnitude of potential impacts to environmental resources within the LCR MSCP planning area. The historic record used by Reclamation in its hydrologic modeling includes periods of low flow on the Colorado River that are similar to the current drought. The following periods of low flow are included in the historic record: 1931–1935 (5-year average: 11.4 maf); 1953–1956 (4-year average: 10.2 maf); 1959–1964 (6-year average: 11.4 maf); 1988–1992 (5-year average: 10.9 maf). Current estimates of the most recent five years of data, 2000–2004 show that the 5-year average is 9.9 maf.

water-level elevations for December 31, 2002[3]. A detailed description of all modeling assumptions are presented in Appendix J, Section J.6.1.

5.2.1.2 Description of Hydrologic Modeling for Reaches 2–6

This section describes the modeling conducted to identify the effects of implementing the future flow-related covered activities for Reaches 2–6. The hydrologic effect of these future flow-related activities would be reductions in flows in these reaches due to total future changes in points of diversion, including shortages, of 1.574 mafy. To analyze the effects of reduction in flows more detail is necessary than is provided by the reservoir model described in Section 5.2.1.1. The methodology is used to translate these flow reductions into changes in elevation in river water surface (river stage), backwaters, and groundwater and the attendant potential impacts to habitats supported by these hydrologic conditions as described in the following sections and detailed in Appendices J and K.

The modeling assumed a "worst case scenario" which includes the assumption that all proposed changes in points of diversion are implemented at the same time immediately following approval of the LCR MSCP even though changes in points of diversion would be phased in over the term of the LCR MSCP (see Table 2-13). Furthermore, the analysis examined the effects in the months of April, August, and December because these periods correspond to sensitive periods of life cycles of listed species.

The hydrologic impacts of the future flow-related actions in Reach 2 (Hoover Dam to Davis Dam) were determined to be insignificant and consequently were not modeled. River stage in this reach is dominated by the reservoir pool of Lake Mohave. Furthermore, reductions in annual releases of up to 0.845 mafy from Hoover Dam represents a very small proportion of the annual releases. Additionally, Reach 2 is confined primarily by steep canyon walls that provide little habitat for marsh and riparian associated covered species.

Similarly, the hydrologic impacts of the future flow-related actions in Reach 6 (Imperial Dam to Morelos Diversion Dam) were determined to be insignificant and consequently were not modeled. This reach is dominated by drainage return flows, not releases from upstream reservoirs that would be affected by the covered activities. Moreover, the anticipated future changes in point of diversion would occur upstream of Imperial Dam, which is upstream of Reach 6, so that flows entering Reach 6 do not change.

The methodology used to determine the effects on Reaches 3–5 is explained below.

[3] As a result of public comments, the participating agencies prepared an evaluation, *Evaluation of Effects Associated with Updated Hydrologic Information*, which was based upon modeling that utilized updated hydrologic information. The new model runs were based on the actual September 30, 2004 elevations of Colorado River reservoirs (including Lake Mead) and updated natural flow data (including years 1991–1995). The evaluation is published in Volume V, *Responses to Comments on Volumes I–IV*, as Section III, and as Attachment E to Appendix J in Volume IV, *Appendices to Volumes I–III and V*.

The evaluation concluded that the inclusion of the updated hydrologic information does not identify any significant new impacts or change the conclusions of effect to covered species in the Draft BA/HCP, and that no changes are required to the LCR MSCP BA, HCP, and EIS/EIR.

River Stage Analysis

The methodology used to determine the effects on downstream river flow and stage due to potential future reductions in releases from Davis and Parker Dams is summarized in this section. A detailed description of the methodology is provided in Appendix J (Section J.6.2).

The effects on downstream river flow and stage due to potential future reductions in releases from Davis and Parker Dams were analyzed. Flow reductions of 0.860 mafy in the river from Davis Dam to Parker Dam (Reach 3) and 1.574 mafy in the river from Parker Dam to Imperial Dam (Reaches 4 and 5) were considered. The methodology employed for Reaches 3–5 comprised the following general steps:

1. Estimate the hourly flows likely to be released from the dams, both before and after the flow reductions have been applied
2. Route the hourly releases downstream to locations of interest
3. Convert the modeled flows at each location to river stage (elevation) to determine the reduction in river stage due to the flow reduction
4. Determine the effects of the reduction in river stage to backwater area extent and depth, and to depth to groundwater proximate to the river

The river stage analysis calculated the reduction in water surface elevation for 33 river channel cross-section locations in Reaches 3, 4, and 5.

These cross-section locations were selected to represent typical river stretches. These locations were distributed throughout Reaches 3–5 River to appropriately cover the entire river between Davis Dam to Imperial Dam. Changes in river stage were calculated at each of these cross-section locations. Data were developed for flow reductions in three different months—April, August, and December, and for the annual median flow. The monthly data were used to calculate impacts to the river channel and backwaters directly connected to the river. The annual median reductions in water surface elevation were used to determine impacts to groundwater and to backwaters that are not directly connected to the river.

River Surface Area

River surface area is influenced by river stage and channel geometry. A change in river stage due to flow reduction would have an associated change in the surface area of the river. The maximum change in river stage at each location was used to compute the reduction in river surface water area. For the purposes of this analysis a uniform bank slope was assumed. Based on this method, the reduction of river acreage was calculated for each river reach. More detail is provided in Appendix K.

Backwaters

Depth and extent of backwaters could be affected by changes in river stage. For backwaters directly connected to the LCR, water surface elevations are assumed to be the same as the connected river surface elevation. For backwaters not directly connected to the river, backwater elevations are assumed to correspond to local groundwater elevation. A total of 380 backwaters were identified and analyzed to determine the potential effects of implementing the future flow-related covered activities. Each backwater was associated with one of the 33 river cross-sections used in the river stage analysis. Based on this methodology, reductions in the acreage of backwater emergent areas, and backwater open water areas were calculated for river Reaches 3–5. More detailed information is provided in Appendix K.

Groundwater

Groundwater adjacent to the river is assumed to be the same as the annual median river stage (see Appendix K). Because of the slow travel time for groundwater movement, changes in groundwater table elevations will lag changes in river stage changes. For that reason, the annual median river surface elevation changes were used in the analysis of groundwater changes. The projected changes in groundwater elevation at the 33 river stage locations were used to develop a contour map of potential groundwater changes.

5.2.2 Effects of Implementing the Flow-Related Covered Activities on Hydrologic Conditions

This section describes the effects of implementing the flow-related covered activities on the hydrological conditions that support covered species habitats. The effects to hydrologic conditions from implementing flow-related activities include changes in Lake Mead reservoir elevation, river flow, and flow-related effects of ongoing OM&R.

5.2.2.1 Lake Mead Elevation[4]

The effects on Lake Mead elevations due to the flow-related covered activities were analyzed using the model described in Section 5.2.1.1. Lake Mead elevations have historically fluctuated due to the annual variability in hydrologic inflows (between elevation 1083 feet msl and 1225 feet msl since 1938). This variability will continue into the future regardless whether the covered activities are implemented. Neither the timing

[4] As more fully described in Chapter 2, Lake Mead elevations are driven by downstream water demands and Glen Canyon Dam releases, except when the Lake Mead Water Control Manual for Flood Control dictates operations. Glen Canyon releases are primarily a function of operation for delivery of water from Lake Powell in accordance with the Colorado River Compact, and Hoover Dam releases are primarily a function of non-discretionary water deliveries from Lake Mead to the lower Division States and Mexico. Thus, Reclamation lacks discretion over the management of reservoir levels in Lake Mead, and lake levels may fluctuate greatly.

of water level variations between the highs and lows, nor the length of time the water level will remain high or low can be predicted.

As described in Appendix J, the model for both the Baseline scenario and the Action Alternative scenario is run using historical flow data to represent future inflows in order to quantify the probable future elevations of Lake Mead. The possible outcomes for future Lake Mead elevations are then statistically analyzed to compare the potential effects of the Action Alternative scenario to the Baseline scenario to provide a range of potential elevations through 2051. The results of the modeling showing the probable elevations under the various probabilities are provided in Table 5-1.

Table 5-1. Comparison of Lake Mead Surface Elevation for the Two Modeling Scenarios

	Baseline Scenario					Action Alternative Scenario				
Year	90th Percentile	75th Percentile	50th Percentile	25th Percentile	10th Percentile	90th Percentile	75th Percentile	50th Percentile	25th Percentile	10th Percentile
2003	1155	1147	1142	1140	1138	1156	1149	1144	1142	1140
2004	1170	1152	1135	1129	1125	1172	1155	1137	1132	1127
2005	1181	1158	1135	1119	1111	1185	1161	1137	1123	1115
2006	1188	1165	1134	1112	1101	1191	1168	1139	1116	1105
2007	1200	1172	1128	1104	1091	1207	1177	1136	1108	1092
2008	1207	1178	1132	1100	1082	1213	1184	1138	1100	1078
2009	1214	1185	1133	1096	1074	1214	1188	1140	1099	1068
2010	1215	1185	1135	1093	1068	1215	1190	1139	1088	1063
2011	1212	1181	1133	1089	1062	1214	1189	1136	1081	1056
2012	1214	1184	1131	1088	1049	1214	1191	1135	1083	1045
2013	1211	1186	1125	1089	1057	1213	1191	1132	1076	1055
2014	1214	1186	1115	1084	1050	1214	1191	1125	1076	1042
2015	1214	1190	1119	1076	1042	1214	1192	1125	1069	1037
2016	1212	1190	1115	1077	1034	1213	1193	1130	1070	1026
2017	1214	1191	1120	1076	1023	1215	1193	1128	1067	1022
2018	1214	1194	1116	1070	1020	1214	1193	1123	1059	1012
2019	1214	1190	1115	1067	1016	1214	1191	1120	1054	999
2020	1214	1193	1114	1062	1008	1214	1193	1119	1057	991
2021	1214	1193	1117	1058	1005	1214	1192	1117	1053	984
2022	1215	1196	1113	1053	1006	1215	1193	1105	1049	984
2023	1214	1194	1113	1051	1005	1214	1193	1109	1046	977
2024	1215	1192	1113	1054	1004	1215	1193	1109	1058	970
2025	1214	1193	1115	1062	1004	1214	1192	1109	1056	970
2030	1214	1194	1118	1050	1005	1214	1192	1107	1043	962
2035	1214	1191	1114	1018	1004	1214	1190	1104	1018	969
2040	1214	1191	1112	1045	1004	1212	1190	1103	1043	966
2045	1214	1187	1103	1052	1004	1213	1183	1101	1048	959
2050	1211	1185	1104	1037	1005	1210	1177	1102	1036	963

As indicated in Table 5-1, under the Baseline scenario, which assumes the continuation of ongoing flow-related covered activities, the elevations of Lake Mead will continue to

fluctuate with a trend towards lower annual median levels (50th percentile) through 2051. This downward trend in Lake Mead elevations is due to projected development in the Upper Basin. This downward trend is also seen under the Action Alternative scenario because the Upper Basin depletions are identical for each scenario. The modeling results for the Action Alternative scenario show that median Lake Mead elevations are likely to be slightly higher through 2021 and then slightly lower from 2022 through 2051 than under the Baseline scenario.

The modeling results show the probability that Lake Mead elevations will be within any particular range during the term of the LCR MSCP. However, for purposes of ESA coverage, a maximum reduction in Lake Mead elevation to 950 feet msl is assumed based on adoption of shortage guidelines within the range as described in Chapter 2.

5.2.2.2 River Flow

River flow is affected by operation of dam facilities and water diversions. These operations provide flood control and river regulation, storage delivery, and diversion of entitlement water, and power production. This results in variations in river flows on a seasonal, daily, and hourly basis. Continuation of these ongoing covered activities will not change the historical variations in river flows and river stage.

Implementation of future flow-related covered activities will result in a maximum reduction in flow of up to 0.860 mafy in Reach 3 and 1.574 mafy in Reaches 4 and 5. The effects to river stage of implementing the future flow-related covered activities were modeled as described above in Section 5.2.1.2 and presented in Table 5-2.

Table 5-2. Changes in River Stage during April, August, and December from Operations under Ongoing Flow-Related Activities and with Implementation of Future Flow-Related Activities, Including an 0.860–maf Flow Reduction in Reach 3 and a 1.574–maf Flow Reduction in Reaches 4 and 5

		Change in Stage (feet) from the Baseline Condition						
			April		August		December	
Reach	River Mile	Median Annual Change	Maximum Change	Minimum Change	Maximum Change	Minimum Change	Maximum Change	Minimum Change
3	270.5	-0.40	-2.09	-0.01	-0.04	-0.08	-0.12	-0.01
3	267.2	-0.43	-2.33	-0.01	-0.04	-0.09	-0.13	-0.01
3	262.9	-0.58	-3.03	-0.01	-0.06	-0.11	-0.18	-0.01
3	255.1	-0.60	-3.02	-0.01	-0.06	-0.11	-0.18	-0.01
3	259.6	-0.57	-2.82	-0.01	-0.06	-0.10	-0.17	-0.01
3	248.9	-0.60	-1.67	-0.20	-0.47	-0.55	-0.40	-0.24
3	243.9	-0.65	-1.82	-0.22	-0.52	-0.59	-0.43	-0.25
3	240.8	-0.61	-1.69	-0.20	-0.48	-0.56	-0.40	-0.24
3	237.6	-0.55	-1.53	-0.19	-0.45	-0.50	-0.36	-0.21
3	234.7	-0.51	-1.34	-0.28	-0.49	-0.49	-0.32	-0.21
3	229.8	-0.47	-1.22	-0.27	-0.48	-0.42	-0.27	-0.15
3	225.0	-0.35	-0.92	-0.21	-0.37	-0.31	-0.20	-0.10
3	220.2	-0.21	-0.55	-0.14	-0.24	-0.18	-0.12	-0.06
4	171.3	-1.14	-2.46	-1.47	-2.03	-0.21	-0.36	-0.29

		Change in Stage (feet) from the Baseline Condition						
		Median	April		August		December	
Reach	River Mile	Annual Change	Maximum Change	Minimum Change	Maximum Change	Minimum Change	Maximum Change	Minimum Change
4	167.6	-1.23	-2.46	-1.59	-2.19	-0.23	-0.39	-0.31
4	160.9	-1.20	-2.65	-1.46	-2.09	-0.23	-0.39	-0.33
4	149.5	-1.22	-2.58	-1.32	-2.01	-0.25	-0.42	-0.42
4	146.9	-0.95	-2.60	-1.02	-1.56	-0.19	-0.32	-0.33
4	135.8	-0.13	-2.01	-0.32	-0.31	-0.02	-0.04	-0.02
4	119.7	-1.17	-0.31	-1.16	-1.68	-0.87	-0.72	-0.73
4	116.5	-1.55	-1.54	-1.52	-2.23	-1.16	-0.98	-1.00
4	114.6	-1.45	-2.03	-1.39	-2.06	-1.09	-0.93	-0.96
4	109.1	-1.44	-1.87	-1.44	-2.08	-1.07	-0.89	-0.90
4	103.1	-1.22	-1.90	-1.28	-1.79	-0.91	-0.74	-0.72
4	96.7	-1.43	-1.65	-1.48	-2.09	-1.06	-0.87	-0.85
5	86.1	-1.16	-1.92	-1.17	-1.55	-1.04	-0.81	-0.84
5	80.4	-0.96	-1.43	-1.03	-1.31	-0.86	-0.63	-0.63
5	72.2	-1.02	-1.23	-1.12	-1.40	-0.91	-0.65	-0.64
5	70.3	-1.04	-1.32	-1.12	-1.42	-0.92	-0.67	-0.66
5	66.1	-1.03	-1.34	-1.21	-1.44	-0.91	-0.61	-0.58
5	56.0	-0.88	-1.39	-1.03	-1.05	-0.94	-0.55	-0.55
5	53.6	-0.49	-1.08	-0.72	-0.61	-0.53	-0.23	-0.22
5	50.8	-0.08	-0.73	-0.13	-0.10	-0.08	-0.03	-0.03

Although there will continue to be variability in the seasonal daily and hourly flows in the river within the range of flows historically seen, there is a projected drop in river stage as a result of the reduced flows from implementing the future flow-related covered activities. The level of change is reflected in Table 5-2, for each of the affected river reaches.

Standard river operating procedures for water deliveries, flood control operations and other management activities would not be changed due to future flow-related covered activities. The full range of water releases historically part of these operations would occur in the future. Because the result of the total 1.574 mafy changes in points of diversion will result in less water flowing into Reaches 3–5, the reduction in flows will change the magnitude and/or duration of seasonal, daily, and hourly releases. Standard hourly release patterns for power generation will not change due to the reduced flows; however, as shown in Figures J-38 and J-40 in Appendix J, there will be small changes in the duration of high and low hourly flows. Major changes in the hourly flow releases in terms of duration or magnitude are not anticipated.

The reductions in river stage would affect the available extent of open water, both in the river itself and to connected backwaters. For purposes of ESA compliance, these effects were measured by the changes in river stage projected for the month of April, which are the largest shown by the modeling as presented in Table 5-2. The reduction in river stage for the month of April ranges from 0.73 foot to 3.03 feet.

To assess the effects on groundwater elevations and on backwaters not directly connected to the river, the annual median projected reduction in river stage was used. As shown in Table 5-2, the annual median change from 0.08 foot to 1.55 feet would result from implementation of flow-related covered activities.

The occurrence of excess flows in Reach 7 results from flood control operations, unanticipated contributions from events such as flooding along the Gila River, and other factors resulting in canceled water orders by users downstream of Parker Dam. Flow-related activities, including Lake Mead water management operations, could affect the magnitude and frequency of excess flow downstream of Imperial Dam and Morelos Diversion Dam. Modeled flows, however, indicate that changes in excess flow due to the flow-related covered actions are likely inconsequential (see Appendix L). Mexico has the capacity to divert up to 200,000 af above its normal monthly water order, minimizing excess flow downstream of Morelos Diversion Dam. Modeled flows, however, indicate that changes in excess flow due to the flow-related covered activities are likely inconsequential (see Appendix L). Mexico has the capacity to divert up to 200,000 af above its annual entitlement, reducing any excess flow downstream of Morelos Diversion Dam.

5.2.2.3 Flow-Related Effects of OM&R Covered Activities on the LCR

The LCR is one of the most highly controlled rivers in North America. The flow regime and channel of the LCR has been extensively modified for hydropower, flood control, and water supply. As a consequence, LCR flow and elevation are highly controlled by dams and diversions (Facilities), levees, and stabilized banks. Modifications to the LCR have been occurring continuously over the past century and the most significant effects occurred at the time the Facilities were constructed or shortly thereafter. The existence of these Facilities in the past, and their continued presence through the next 50 years, will continue to affect the physical characteristics of the LCR. As described in Chapter 4, the effects of the construction and existence of these Facilities are part of the baseline condition of the LCR, and thus are not considered effects of the covered activities.

This section provides a qualitative analysis of the potential indirect effects of implementing the non-flow related ongoing and future OM&R covered activities on the LCR (the direct effects of these covered activities are addressed in Sections 5.3 and 5.5). These covered activities are described in Chapter 2 (Sections 2.2.3 and 2.2.4) and consist of: bankline stabilization and maintenance, levee maintenance, and sediment control. This section also addresses certain indirect effects of flow-related covered activities (flood control, water delivery, and power production) as operational activities within the definition of OM&R. As described below, a quantitative analysis of the indirect effects of ongoing OM&R and OM&R that could occur in the future cannot be performed because the indirect effects resulting from those actions are confounded by similar effects resulting from the existence of the Facilities and past OM&R activities.

Indirect effects of the covered activities included in this section include effects on river flow and associated geomorphic processes (e.g., erosion, overbank flow, scour) that have substantially altered the physical conditions in the LCR. The LCR channel was

constrained by the past construction and continued existence of the Facilities, thus reducing the ability of the LCR to 1) erode banks, 2) transport and deposit sediment, and 3) inundate its historical floodplain. For example, the past actions have resulted in LCR channel downcutting which has contributed to lowering of groundwater levels, and, in combination with levees, reduction in the frequency of overbank flood events that provide the conditions necessary for establishment of cottonwood and willow. Past OM&R activities, both flow and non-flow related, provided a further reduction in the regeneration of cottonwood and willow (e.g., less erosion and sedimentation inhibits the formation of channel bars that provide substrate for germination and establishment of seedlings) and degradation or loss of backwaters and marshes (i.e., reduction in overbank flows that scour accumulated sediment from backwaters and marshes facilitates successional processes, degrades their function as habitat for associated covered species, and can provide for their eventual replacement with upland land cover types). Further, the total impact of the past activities may not have yet been manifested in the current conditions seen in the LCR. For example, ongoing effects of past bank stabilization and levees continue to artificially constrain river flow and thus are a factor contributing to future incision of the LCR channel.

The combined flow-related effects of ongoing and future OM&R activities may result in continuing minor channel degradation through:

- loss of lateral channel movement (preventing meandering),
- additional channel downcutting in locations where the LCR substrate remains erodible,
- reduction of sediment load and transport (by dredging, bank stabilization), and
- a reduction in channel scouring events.

The contribution to these flow-related effects from ongoing OM&R cannot be quantitatively measured but is expected to be minimal. The effects of continuing the existing flow and non-flow related OM&R covered activities could contribute to existing backwaters and marshes undergoing successional changes toward upland conditions, with little or no natural replacement. Incisement of the LCR channel contributes to lowering groundwater levels thus potentially affecting riparian vegetation beyond the manifested and unmanifested effects of baseline conditions. It is also likely, however, that the flow-related effects of ongoing OM&R-related activities would be within the range of channel incisement attributable to baseline and thus would not be additive to those effects. Flood control regimes also reduce the likelihood of flooding that overtops existing banks and scours adjacent lands that create conditions providing for the establishment of desirable plant species. Based on the best available information, however, it is not possible to determine the degree to which ongoing flow-related covered activities may inhibit future regeneration of cottonwood and willow beyond that caused by the past actions. As described above, adverse changes in LCR conditions resulting from the combined effects of routine ongoing OM&R activities would be very gradual and unmeasurable from year to year, and would be minimal relative to the effects of past actions under the baseline. Although the minimal effects associated with the ongoing flow-related covered activities cannot be disaggregated from the effects of past actions under baseline, the LCR MSCP conservation measures are designed to provide sufficient benefits to the covered species and their habitat, to ensure that the minimal effects of ongoing covered activities are also fully mitigated.

In addition, the effects of flow-related routine ongoing OM&R covered activities cannot be disaggregated from the larger effects of the future flow-related covered activities. As described in Section 5.5, implementation of future flow-related covered activities will result in the removal or degradation of covered species habitats, some of which, in the absence of implementing the future covered activities, may also be affected by the ongoing OM&R covered activities. For example, implementation of the future flow-related covered activities are assumed to remove or degrade all of the cottonwood-willow land cover types that provide covered species habitat where groundwater elevations are expected to be lowered. This effect would subsume the small incremental potential effects that ongoing OM&R covered activities would have on these same habitats. Although the minimal flow-related effects associated with the ongoing flow-related covered activities cannot be disaggregated from the effects of past actions under baseline and future covered activities, the LCR MSCP conservation measures are designed to provide sufficient benefits to the covered species and their habitat, in addition to that required to fully mitigate the effects of future covered activities, to ensure that the minimal effects of ongoing covered activities are also fully mitigated.

5.2.3 Effects of Hydrological Changes on Habitat Conditions

This section describes the potential effects of flow-related covered activities on environmental conditions that provide habitat for covered species. Effects of flow-related covered activities on each covered species' habitat are fully described in Section 5.5.

5.2.3.1 Key Assumptions Related to Groundwater Effects on Land Cover Types and Covered Species Habitat

In addition to the results of the hydrologic modeling, the following assumptions were used to conduct the assessment of impacts of flow-related covered activities on covered and evaluation species.

- Proposed changes in points of diversion are assumed to take place and result in annual flow reductions of 0.860 mafy in Reach 3 and 1.574 mafy in Reaches 4 and 5. Although the analysis of flow-related effects assumed the changes in points of diversion are implemented in their entirety at the beginning of the term of the LCR MSCP, the actual timing of implementation of proposed changes in points of diversion is not known at this time.
- Groundwater levels in the river floodplain are most closely related to the annual median water surface elevations of the river. These effects are reduced by the presence of irrigated agriculture.
- Although change in groundwater elevation may affect soil moisture and other environmental conditions, the maximum predicted change in groundwater elevation is assumed not to result in the loss of honey mesquite bosques that provide habitat for the elf owl, vermilion flycatcher, and Arizona Bell's vireo.

- An element of MacNeill's sootywing skipper habitat is the presence of moist microclimate conditions beneath adjacent patches of honey mesquite and quailbush. MacNeill's sootywing skipper habitat is assumed to be lost where groundwater elevations are predicted to be lowered beneath its habitat.
- An element of southwestern willow flycatcher breeding habitat is the presence of ponded water or moist soil surface conditions during the breeding season. Southwestern willow flycatcher breeding habitat is assumed to be lost, based on Reclamation's measurements of surface water depths in delineated breeding habitat and predicted effects of flow-related covered activities on groundwater elevations, where groundwater elevations are expected to decline in delineated habitat sufficiently to eliminate the surface soil moisture conditions required by the species to nest and rear young.
- The LCR MSCP species habitat models (see Section 4.6.2.1) do not consider that land cover types that may only receive low levels of use by individuals of a covered species (predominantly saltcedar and mixed saltcedar communities) constitute habitat. Effects of implementing flow-related covered activities could include the loss of moist surface soil conditions in stands of saltcedar that may be used by some covered bird species. As described in the previous assumption, the loss of moist surface soil conditions in saltcedar and mixed-saltcedar stands have been identified as part of the analysis of effects on the flycatcher. Habitat that will be created as mitigation for these effects on the flycatcher will also mitigate for any effects on the loss of these areas on other covered species.
- Federal non-flow-related activities will result in removal of habitat for covered species in Reaches 3–5 that would otherwise be adversely affected by flow-related activities. To avoid double counting of impacts, this analysis assumes that the Federal non-flow-related activities will, with the exception of Gila woodpecker habitat, remove covered species habitat before flow-related activities are implemented, and these effects, therefore, are included as an effect of the non-flow-related covered activities and are not included as an effect of the flow-related covered activities (see Table 5-5).
- Change in groundwater elevation associated with implementation of the flow-related covered activities is assumed to adversely affect the extent of cottonwood-willow, marsh, backwater, and river land cover types that provide covered species habitat under the area with declining groundwater. The assessment assumes that any predicted drop in groundwater elevation associated with flow-related covered activities will result in the degradation of the habitat provided by cottonwood-willow land cover. Because the range of groundwater elevations will not cause effects to all overlying cottonwood-willow habitat, the approach to the analysis of impacts on covered species habitat that is provided by cottonwood-willow land cover may result in an overestimate of adverse effects on habitat for some species (e.g., if, following implementation of flow-related activities, the groundwater elevation beneath a patch of cottonwood-willow is still within the root zone of cottonwood and willow trees, the trees would survive, whereas this analysis assumes they would not). The habitat for species associated with affected cottonwood-willow land cover that will be replaced with implementation of the LCR MSCP therefore inherently includes some level of habitat replacement beyond that required to mitigate effects on those species and would contribute to the recovery of those species.

- Effects on groundwater levels that support covered species habitat at Topock Marsh will be avoided by maintaining water deliveries for maintenance of water levels and existing conditions. At times, flow-related activities could lower river elevations to levels that could disrupt diversion of water from the river to the marsh. Improvements to intake structures that allow water to continue to be diverted or other measures to maintain the water surface elevation will avoid effects on groundwater elevation. The extent of covered species habitat effects that will be avoided by maintaining water deliveries to Topock Marsh is presented in Table 5-3. Maintaining water deliveries to Topock Marsh will also avoid effects on razorback sucker and bonytail habitat associated with disconnected backwaters managed for these species.

- The water surface elevation in backwaters not directly connected to the LCR by a surface connection is assumed to correspond to the local groundwater elevation. Consequently, the probable change in groundwater elevation related to the change in annual median river surface elevation with implementation of the covered activities was assumed to be the change in elevation of backwaters not directly connected to the LCR by a surface connection. Table 5-2 shows the annual median river surface elevations and April, August, and December maximum and minimum elevations for selected locations along the LCR in Reaches 3–5.

- Water surface elevations in backwaters directly connected to the LCR by surface connection are assumed to be the same as the connected river surface elevation. The probable minimum LCR elevations in April (the month in which the greatest probable decline in elevations would be manifested) with implementation of covered activities was assumed to be the probable change in elevation of backwaters directly connected to the LCR by a surface connection (see Table 5-2).

- Marsh vegetation that provides habitat for covered species and that can be affected by implementation of flow-related covered activities is emergent marsh vegetation that grows in association with open water provided in backwaters. Marsh vegetation supported by reservoirs or other locations where conditions would maintain existing water levels in Reaches 2–7 will not be affected by flow-related covered activities. The extent of change in marsh vegetation associated with backwaters with implementation of the flow-related covered activities is determined by the probable change in backwater elevations in April, the month in which modeling indicated flow-related covered activities would have the greatest affect (see Appendix K).

- Reclamation is involved with the operation and maintenance of wells that maintain groundwater levels in the Yuma area. The future operation of these wells will not have additional effects to groundwater levels in Reaches 6 and 7 over the existing condition.

Table 5-3. Extent of Effects on Covered Species Habitat Avoided with Implementation of Conservation Measures to Maintain Water Deliveries to Topock Marsh with a Reduction in Annual Flow of 0.860 maf in Reach 3

Species	Habitat Effects Avoided (acres)
Threatened and Endangered Species	
Yuma clapper rail	16[a]
Southwestern willow flycatcher	2,135
Other Covered Species	
Colorado River cotton rat	16[a]
Western least bittern	16[a]
California black rail	16[a]
Yellow-billed cuckoo	133
Gilded flicker	133
Vermilion flycatcher	133
Arizona Bell's vireo	133
Sonoran yellow warbler	2,224

[a] Results of modeling indicate that only 16 acres of marsh land cover type, which provides habitat for this species, could be affected by flow-related covered activities at Topock Marsh.

5.2.3.2 Cottonwood-Willow along the LCR

As described above, the reduction in river flow attributable to future flow-related covered activities may lower groundwater levels under several thousand acres of lands adjacent to the river. Stands of cottonwood-willow with the appropriate structure (see Table 4-9) provide habitat for the following species:

- southwestern willow flycatcher,
- western red bat,
- western yellow bat,
- Yuma hispid cotton rat,
- yellow-billed cuckoo,
- elf owl,
- gilded flicker,
- Gila woodpecker,
- vermilion flycatcher,
- Arizona Bell's vireo,
- Sonoran yellow warbler, and
- summer tanager.

Any drop in groundwater elevation under areas supporting cottonwood-willow is assumed to result in the degradation or loss of the vegetation that characterizes the elements of habitat for associated covered species. The extent and quality of cottonwood-willow land cover would be expected to decline relative to baseline conditions. Seed dispersal, germination, and establishment of young plants—necessary to support recruitment in existing cottonwood-willow communities—require seasonal inundation of the floodplain that is currently not supported by existing flow over much of the LCR MSCP planning area. As described in Appendix K, implementation for the flow-related covered activities could affect up to 2,008 acres of cottonwood-willow land cover in Reaches 3–5.

Lower groundwater levels in Reaches 3, 4, and 5 could increase mortality of trees in existing cottonwood-willow stands and would be expected to reduce productivity of the understory. Within the projected range of groundwater lowering, existing saplings and mature trees will likely survive the gradual change in groundwater level because their roots are expected to grow downward at rates commensurate with the rate of groundwater lowering. The effect cannot be precisely determined because existing groundwater elevations are unknown, and the reduction in groundwater will occur over an extended period (i.e., 30 or more years). The analysis of flow-related effects, however, assumes that all patches of cottonwood-willow that overlay areas where groundwater elevations are expected to decline would be degraded or lost, resulting in the degradation or loss of covered species habitats that are provided by the affected patches of cottonwood-willow. The successful establishment of cottonwood and willow seedlings is closely correlated with spring floodflows that disperse seeds and inundate substrates that are suitable for cottonwood-willow germination and growth. River reaches in the LCR MSCP planning area upstream of the Gila River confluence are regulated by operation of reservoirs, and the periodicity and magnitude of floods have been substantially reduced from historical conditions. In addition, the extent of substrates suitable for seedling establishment has also been substantially reduced from historical conditions as a result of loss of sediments from the river, which establish sand and gravel bars, and the construction of levees. The present limited potential for cottonwood-willow seedlings to establish and survive on sites with suitable substrates and soil moisture conditions may be reduced in the future if groundwater levels drop sufficiently at those sites to preclude future establishment and growth of seedlings. Studies from the Hassayampa River indicate that Fremont cottonwood seedlings naturally established on suitable surfaces within 0.7–3.3 feet of groundwater. The studies indicate that the highest success of seedling recruitment occurred where groundwater is within 0.7–1.3 feet of the ground surface (Stromberg 1993b) and is within the range of the predicted reduction in groundwater elevations.

Reduction in groundwater levels could also affect the composition of understory vegetation in cottonwood-willow stands (Stromberg et al. 1996). Studies along the Hassayampa and San Pedro Rivers show that streamside herbaceous vegetation was associated with mean groundwater depths of 1.0–1.5 feet (Richter 1993; Stromberg et al. 1996). Lower groundwater elevations may affect the composition of understory vegetation, microhabitat conditions (e.g., higher temperature, lower humidity), percent plant cover, and type and biomass of invertebrate production in cottonwood-willow stands. Food web support for covered species that forage on flying insects would be substantially reduced in cottonwood-willow stands that currently have saturated soils or pond water during some periods but which would no longer have these conditions following a reduction in groundwater elevation.

Cottonwood and willow seed dispersal, germination, and establishment depend primarily on inundation of soil with flood events. Although modeling indicates that future operation of Lake Mead with implementation of flow-related covered activities could have minimal effects on the probability of flood events in Reaches 3–7 (see Section 5.2.2.2, Appendix J, and Appendix L), these effects would be slight and would not affect habitat conditions for the covered species. However, existing stands will age and die out because the extent, frequency, duration, and timing of flood events have been substantially modified by existing facilities and ongoing operations that occur under the baseline conditions.

5.2.3.3 Marsh along the LCR

Marsh is present in all river reaches in the LCR MSCP planning area and provides habitat for Yuma clapper rail, California black rail, western least bittern, and Colorado River cotton rat. Marsh vegetation grows:

- along the margins of isolated and connected backwaters, the main and side channels of the LCR, and reservoir coves;
- behind dams on the mainstem of the river;
- on wildlife refuges that are managed to maintain marsh; and
- in drains and canals that maintain sufficient water to support the establishment and growth of emergent vegetation.

The quality and extent of marsh vegetation associated with backwaters in the LCR MSCP planning area are expected to decline relative to existing conditions with implementation of future flow-related covered activities. Future flow-related covered activities could affect marsh vegetation and the covered species habitats it provides by lowering mean groundwater elevations in backwaters in Reaches 3, 4, and 5 (see Appendix K). Based on supporting hydrology, two types of marsh are present in the LCR MSCP planning area: 1) marshes that are directly connected to the river or that are groundwater dependent and 2) marshes that have been formed by reservoirs or impoundments (e.g., Lake Mead, Lake Havasu, Mittry Lake) (Bureau of Reclamation 1996). As described in Section 5.2.1.1, with the exception of Lake Mead, the frequency and rate of reservoir fluctuations will be similar to baseline conditions, so that the future flow-related activities will not cause effects on marshes supported by reservoirs.

The types of effects that could be expected if groundwater and river surface elevations are lowered sufficiently include:

- a change in marsh plant composition (e.g., replacement of cattail by common reed);
- a conversion of marsh land cover to woody riparian land cover types;
- an increase in plant density and extent, resulting in the loss of open water;
- a change in marsh function (e.g., change in invertebrate communities, species composition, or production); and

- desiccation of emergent vegetation in drains and canals if water conveyed through a drain or canal is not sufficient to maintain the vegetation.

An increase in the range of daily fluctuations in surface water elevations in marshes with changes in points of diversion also could affect the quality of habitat provided for some covered species (e.g., lower water levels could reduce the availability of cover and food for Yuma clapper rails) (U.S. Fish and Wildlife Service 2001). As described in Appendix K, implementation of the flow related covered activities could affect up to 133 acres of emergent vegetation associated with backwaters.

5.2.3.4 Lake Mead Conditions

The analysis of effects of flow-related covered activities on river flow and Lake Mead reservoir elevations in this section is based on information provided in Appendix J, "Technical Documentation of Ongoing and Future Operations," and Appendix M, "Effects of LCR MSCP Flow-Related Activities on Lake Mead."

As described in Section 5.2.2.1, "Lake Mead Elevation," implementation of future flow-related covered activities may affect Lake Mead reservoir elevations from baseline conditions. Changes in reservoir elevations may affect the establishment of riparian and marsh vegetation at the deltas of rivers entering Lake Mead (see Appendix M); razorback sucker spawning habitat (see Appendix M); transitory river segments that may support humpback chub, razorback sucker, and flannelmouth sucker habitat; and the sticky buckwheat and threecorner milkvetch.

Riparian Vegetation

Riparian vegetation that could provide habitat for the southwestern willow flycatcher, western red bat, western yellow bat, yellow-billed cuckoo, Arizona Bell's vireo, Sonoran yellow warbler, and summer tanager may establish as Lake Mead reservoir elevations fluctuate over the term of the LCR MSCP at the Lake Mead delta, Virgin River delta, Muddy River delta, and the portion of the Grand Canyon influenced by Lake Mead. Most of the Lake Mead shoreline, however, does not have the soil necessary for the establishment of riparian vegetation. The extent of riparian vegetation that could establish as reservoir elevations decline, however, cannot be predicted.

The Lake Mead delta areas have a great potential for use by covered species when present and habitat has developed, but are limited in their importance due to their ephemeral nature. When riparian vegetation develops as habitat for these species, abundance and productivity can rise substantially. Conversely as vegetation dries out when reservoir elevations subsequently decline, or is inundated when elevations subsequently rise, species abundance and productivity decreases (Braden and McKernan unpublished data 2002). This ephemeral habitat, thus, has a high productivity value when present and is beneficial to riparian-associated species as a whole.

Habitat in the delta areas may consist of predominantly native willow, predominantly exotic saltcedar (*Tamarisk* spp.) or mixed native/saltcedar. Establishment of native

willow or cottonwood dominated stands would provide habitat for all of the covered species described above. Saltcedar dominated stands could provide habitat for the southwestern willow flycatcher and Sonoran yellow warbler when appropriate moist surface soil conditions are also present. The Colorado River delta has previously produced a vegetation community largely composed of native willow with relatively little saltcedar (McKernan 1997). A major factor governing the types of riparian vegetation that could establish is the timing of when sediments suitable for establishment of riparian vegetation are exposed. Willow-dominated communities have become established in the deltas of Lake Mead only when declining reservoir elevations have coincided with the timing of willow seed dispersal. During periods when reservoir elevations have declined before or after the willow seed dispersal period, saltcedar-dominated riparian communities have become established (see Appendix M, Section M.5.3). Cottonwood and willow that do become established when reservoir elevations decline could be lost if reservoir elevations continue to decline and groundwater elevations drop below their root depths. Conversely, riparian vegetation that does become established on exposed sediments would be inundated and lost during wetter periods when Lake Mead reservoir elevations rise.

For example, while from 1990–1996 Lake Mead reservoir levels remained within the 1170–1200-foot range creating dense stands of willow (approximately 1000 acres) (McKernan and Braden 1998), the levels from 2000–2004 dropped drastically from 1214 feet to 1125 feet, creating a delta that does not support the same dense vegetation, and has created conditions in which the willows and even saltcedar are rapidly dying (Bureau of Reclamation unpublished data 2004). This would suggest that a sustained lake level would create the best suited habitat for LCR MSCP covered species, and that extreme rises or falls in reservoir elevations would not sustain covered species habitat in the Lake Mead delta areas. As lake levels continue to drop, new delta habitat may form lower in the lake. This would be limited by the Lake Mead shoreline as most of the shoreline does not have the soil necessary for the establishment of riparian vegetation. The extent of riparian vegetation that could establish as reservoir elevations decline, however, cannot be predicted.

Marsh Vegetation

Ephemeral marsh vegetation can periodically establish at inflow points of Lake Mead (e.g., Lake Mead delta, Virgin River delta, Muddy River delta, Las Vegas Wash), when Lake Mead water surface elevations are below full pool elevation. This ephemeral marsh vegetation can provide nesting and dispersal habitat for the Yuma clapper rail and western least bittern. Habitat that does become established could be lost if reservoir elevations decline and groundwater elevations drop below the rooting depths of emergent vegetation. Marsh vegetation that does become established on exposed sediments would be inundated and lost during wetter periods, when Lake Mead reservoir elevations rise. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations over the term of the LCR MSCP cannot, however, be predicted based on the available information.

Razorback Sucker Spawning Habitat

Implementation of flow-related covered activities may result in adverse effects on razorback sucker spawning habitat and designated critical habitat for the razorback sucker in Lake Mead. The known spawning elevations that may be important for the razorback sucker occur between 1,120 and 1,150 feet msl in Lake Mead. Current information shows that during the spawning seasons of 1997–2001, razorback sucker spawned at or near the cliff spawning site at the back of Echo Bay. This site was dry in 2002 and spawning occurred in a different area along the south shore of Echo Bay. During the 2003 spawning season, the 2002 spawning site was dry. However, razorback sucker apparently spawned along the same shore just east of the 2002 spawning site on a gravelly point submerged in 2–5 feet of water. In 2004 larval concentrations and habitat use of a telemetered fish indicated the Echo Bay population spawned approximately 250 meters east of the 2003 site (Welker and Holden 2004). These changes in spawning location over the past few years indicate the razorback sucker will successfully move their spawning location into progressively lower elevations where suitable spawning substrate is present as the lake recedes. Findings of recent investigations (Twichell and Rudin 1999) indicate that it is unlikely that sediment accumulation over available spawning substrate will affect spawning habitat area. However, indications are that in 2004 sediment from the Las Vegas Bay delta has moved further out and caused the presumptive spawning area in the bay to become covered with encroaching sediment and may have influenced spawning success (Welker and Holden 2004). This encroaching sediment is a result of outflow from Las Vegas Wash and is not typical of sediment encroachment in the rest of Lake Mead. That encroachment is not only a function of lowering lake levels, but is likely also related to high rainfall events and growing wastewater discharge as a result of growth in the Las Vegas area.

Results of razorback sucker studies indicate successful recruitment of minimal numbers of razorback suckers in Lake Mead during years that favorable rearing conditions are present. This makes the population of razorback suckers in Lake Mead unique in that it is the only population that has persisted over a long period of time in any portion of the lower Colorado River. However, these conditions are infrequent, and the numbers of fish naturally recruited to the population may not be sufficient to sustain the population under existing conditions. Reservoir operations and other factors that create the conditions that result in new fish successfully entering the population are not well understood. It has been postulated that during periods of lower lake elevations, vegetation becomes established along the shoreline. Then when the lake rises, the vegetation that becomes inundated provides cover for young razorback suckers. Recruitment has occurred fairly regularly from 1974–1998. Sufficient information is not available to determine if changes in reservoir elevation with implementation of the action alternative could adversely affect the current observed rate of recruitment. However, it can be postulated that due to the probability of lower lake levels in the foreseeable future, short term annual rises in lake elevation could inundate established vegetation that would provide cover for juvenile razorback suckers, thus maintaining a similar level of recruitment to the population.

Transitory River Segments

When Lake Mead reservoir elevations decline, segments of the Colorado River and Virgin River channels that existed prior to construction of Hoover Dam can become exposed within the full-pool elevation of Lake Mead (i.e., transitory river segments). These transitory river segments can provide for and be occupied by the humpback chub, razorback sucker, and the flannelmouth sucker, which are covered under the LCR MSCP. The few humpback chub currently occurring in the Grand Canyon could move downstream and utilize as much as an estimated 62 miles of transitory Colorado River channel that forms when reservoir elevations lower to an elevation of 950 feet msl. This is the elevation that is assumed to be protected by the modeled shortage assumptions. The razorback sucker and flannelmouth sucker could occur in transitory river segments of both the Colorado River and Virgin River that form when reservoir elevations are below full pool elevations. This transitory habitat could be lost during wetter periods when Lake Mead reservoir elevations increase and inundate habitat.

Sticky Buckwheat and Threecorner Milkvetch Habitat

Within the LCR MSCP planning area, sticky buckwheat and threecorner milkvetch can establish and occur along the Lake Mead shoreline on sites that are exposed when Lake Mead water surface elevations are below full-pool elevation and that have the soil characteristics required by each species. Sticky buckwheat and threecorner milkvetch plants that establish on these sites would be inundated and lost during wetter periods, when Lake Mead reservoir elevations increase.

5.2.3.5 River Conditions

Reach 2

As described in Section 5.2.1.2, river channel and Lake Mohave reservoir conditions in Reach 2 are not expected to be affected with implementation of future flow-related covered activities and, therefore, habitat conditions are not expected to change.

Reach 3

The water surface elevation for minimum hourly river flows in April may fall as much as 3.0 feet with the implementation of future flow-related covered activities. The river's edge, riffles, and side channels may be substantially affected. Depending on site-specific channel morphology, reduced depth in association with ongoing daily flow fluctuation could affect stranding of fish and desiccation of fish eggs and aquatic organisms in or on the substrate. The change in surface area in response to reduced depth under minimum flows indicates that the change in river surface area would be relatively small (i.e., 53 acres in the month of April representing about 1.5 percent of the total river surface area in Reach 3). The level of existing stranding and desiccation and how flow variability at a lower surface elevation interacts with channel morphology are currently unknown. The change in potential fish stranding losses and desiccation of aquatic

organisms, therefore, may be minor, especially relative to productivity for the entire reach. However, the reduced river depth, in combination with ongoing daily flow fluctuation, could increase stranding losses and desiccation relative to the baseline condition.

The reduction in flow with implementation of future flow-related covered activities is not expected to measurably affect water temperature. Given that operations at Lake Mohave will not change, the temperature of the discharge from Davis Dam would not be affected.

River flow also affects contaminant concentration, which is the density of any undesirable physical, chemical, or biological constituent at concentrations not normally present in water. Dilution can be important if contaminants approach levels that are lethal or have chronic effects on aquatic species. Lower flow, with implementation of future flow-related covered activities, may result in higher contaminant concentrations. In addition to reduced flow, input of contaminants within Reach 3 may increase because LCR MSCP conservation areas that are established on currently unirrigated lands will be irrigated to establish and maintain created covered species habitat, and could produce irrigation runoff. However, the level of contaminant input from these conservation areas is expected to be less than from irrigated farmlands. Although contaminant levels may increase, they have not been identified as a major factor affecting covered species in this reach, and effects of flow changes and the additional, relatively small, input from conservation areas may be inconsequential.

Diversions directly from the river may entrain aquatic organisms. River flow would be reduced in Reach 3 and would result in an increase in the proportion of flow diverted. However, there are relatively few diversions directly from the river channel segment in Reach 3, and the diversions are small relative to river flow volume. The primary diversions in Reach 3 are from Lake Havasu, including the Metropolitan and CAWCD diversions. Risk of entrainment of aquatic organisms related to the influence of the diversion will be minimally affected and will be similar to existing conditions.

Reach 4

With implementation of future flow-related covered activities, the reduction in river surface elevation for the minimum hourly flow in April may fall as much as 2.7 feet. As indicated for Reach 3, the river's edge, riffles, and side channels may be substantially affected. Depending on site-specific channel morphology, reduced depth in association with ongoing daily flow fluctuation could affect stranding of fish and desiccation of fish eggs and aquatic organisms in or on the substrate. The change in surface area in response to reduced depth under minimum flows indicates that the change in river surface area would be relatively small (i.e., 137 acres in the month of April in Reaches 4 and 5 representing about 1.5 percent of the total river surface area in these reaches). The level of existing stranding and desiccation and how flow variability at a lower surface elevation interacts with channel morphology are currently unknown. However, the reduced river depth, in combination with ongoing daily flow fluctuation, could increase stranding losses and desiccation relative to the baseline condition.

The reduction in flow with implementation of covered activities is not expected to measurably affect water temperature. Given that variability in reservoir storage and

water surface elevation would be the same as for baseline conditions for Lake Havasu, the temperature of the discharge from Parker Dam with implementation of future flow-related covered activities would be similar to the temperature for baseline conditions. Lower flow with implementation of future flow-related covered activities would not affect downstream water temperatures because temperatures reach ambient conditions in the pool created by Headgate Rock Dam.

Lower flow, with implementation of future flow-related covered activities and LCR MSCP conservation measures, may result in higher contaminant concentrations. In addition to reduced flow, input of contaminants within Reach 4 may increase from runoff from LCR MSCP conservation areas that are established on currently unirrigated lands that will be irrigated to establish and maintain created covered species habitat. The level of contaminant input from these conservation areas, however, is expected to be less than from irrigated farmlands. Although contaminant levels may increase, they have not been identified as a major factor affecting aquatic organisms in this reach, and effects of flow changes and the additional, relatively small, input from conservation areas may be inconsequential.

Diversions directly from the river may entrain aquatic organisms. Major diversions occur at Headgate Rock Dam and Palo Verde Diversion Dam. River flow would be reduced in Reach 4 by implementation of covered activities, and the proportion of flow diverted would increase.

Reach 5

With implementation of future flow-related covered activities, the reduction in river surface elevation in Reach 5 approaches 1.4 feet for minimum hourly flow in April. As indicated for Reaches 3 and 4, the river's edge, riffles, and side channels may be substantially affected. The change in surface area in response to reduced depth under minimum flows indicates that the change in river surface area would be relatively small (i.e., 137 acres in the month of April in Reaches 4 and 5 representing about 1.5 percent of the total river surface area in these reaches). The reduced river depth, in combination with ongoing daily flow fluctuation, could increase stranding losses and desiccation of aquatic organisms and fish eggs relative to the baseline condition.

Lower flow with implementation of covered activities may result in higher contaminant concentrations. In addition to reduced flow, input of contaminants in Reach 5 may increase from runoff from LCR MSCP conservation areas that are established on currently unirrigated lands that will be irrigated to establish and maintain created covered species habitat. The level of contaminant input from these conservation areas, however, is expected to be less than from irrigated farmlands. Diversions from Reach 5 are relatively minor, except for diversions at Imperial Dam, where most of the river flow is diverted into canals under both existing conditions and with implementation of flow-related covered activities.

Reach 6

As described in Section 5.2.1.2, river channel conditions in Reach 6 are not expected to be affected with implementation of future flow-related covered activities and, therefore, habitat conditions are not expected to change.

Reach 7

As described in Section 5.2.2.2, river channel conditions in Reach 7 are not expected to be substantially affected with implementation of future flow-related covered activities and, therefore, habitat conditions are not expected to measurably change (see Appendix L).

5.2.3.6 Backwater

Open water and emergent vegetation components of backwaters provide habitat for the Yuma clapper rail, western least bittern, California black rail, bonytail, razorback sucker, and flannelmouth sucker. Natural maintenance of backwaters over the long term depends on river channel migration. Under existing conditions, the absence of annual high flows in excess of 40,000 cfs has virtually eliminated these river processes. Long-term natural succession may gradually fill existing backwaters and will result in a net loss of backwaters that are gradually replaced by riparian vegetation.

The level of effect of flow-related covered activities on backwaters varies, depending on the connection to the river. The change in river flow described above for Reaches 3–5 (see Section 5.2.2.2, "River Flow") would affect backwater water depth, surface area, flow continuity, and contaminant concentration. Environmental conditions in backwaters that depend on the frequency and rate of reservoir fluctuations will be similar to baseline conditions, so that the future flow-related activities in reservoirs will not cause effects to backwaters (see Section 5.2.1.1).

Although the reduction in river surface elevation that relates to groundwater is relatively small for median flows, the elevation for minimum daily flow in April (see Table 5-2) may fall as much as 2.7 feet with the implementation of covered activities. The change in surface area in response to reduced depth indicates that the change in backwater area would be small relative to total backwater area and, for connected backwaters, river area (i.e., 209 acres in the month of April representing about 2 percent of the total surface area of backwaters in Reaches 3–5). Backwaters that are directly connected to the river are more sensitive to river flow changes than are backwaters dependent on groundwater elevation only. For connected backwaters, reduced backwater depth, in combination with ongoing daily flow fluctuation, could increase stranding losses, displacement of small juveniles from nursery habitat and cover, and desiccation of aquatic organisms and fish eggs relative to the baseline condition. Effects depend on currently undocumented site-specific channel morphology and, given the relatively small proportion of backwater area affected, may be minor relative to productivity for all connected backwaters.

Reduced river flow may affect contaminant concentration in connected backwaters in Reaches 3, 4, and 5. In addition, input of contaminants within connected backwaters may increase from runoff from irrigated conservation areas that were used to create habitat as part of the LCR MSCP.

River conditions in Reaches 6 and 7 attributable to flow-related covered activities associated with water supply and power generation would be unchanged relative to baseline conditions. Therefore, no additional effects to backwaters due to future flow-related covered activities are anticipated.

5.3 Assessment of Non-Flow-Related Covered Activities

Federal non-flow-related covered activities are described in Chapter 2 and non-Federal non-flow-related covered activities described in Chapter 3. Non-flow-related activities primarily affect species and their habitat within the footprint of the activity. The indirect effects of non-flow-related covered activities on riverine processes (e.g., meandering) and the covered species habitats they support are described in Section 5.2.2.3.

This section describes the mechanisms through which non-flow-related covered activities could impact covered species and the assumptions used to conduct the assessment of those impacts.

5.3.1 Impact Mechanisms

The primary impact mechanisms for non-flow-related activities are physical and biological disturbance. These disturbances are described below.

5.3.1.1 Physical Disturbance

Physical disturbance is the removal or displacement of vegetation, topsoil, substrate, or overburden or the placement of topsoil, substrate, spoils, processed waste, or other material. Based on the description of the covered activities in Chapter 2, "Description of Federal Actions (Covered Activities)," and the assumptions below in Section 5.3.2, physical disturbance associated with Federal non-flow-related covered activities that could affect covered species primarily could result from operation of equipment to:

- maintain the stable location and slope of the river channel, including dredging; bank maintenance; and maintenance of levees, jetties, and training structures;
- maintain desilting basins, boat ramps, gaging stations, and other facilities described in Chapter 2;
- implement habitat restoration projects; and
- implement projects to convert natural land cover types to agricultural uses.

Based on the description of the covered activities in Chapter 3, "Non-Federal Covered Activities: Ongoing and Future," and the assumptions below in Section 5.3.2, physical disturbance associated with non-Federal non-flow-related covered activities that could affect covered species primarily could result from operation of equipment to:

- periodically remove (e.g., chaining, dredging) marsh vegetation from canals, drains, and other water conveyance facilities;
- implement habitat restoration and maintenance projects; and
- maintain navigation aids, boat ramps, and boat docks, and install artificial fish habitat structures.

Physical disturbance usually results from activities with a specific footprint, where the disturbance occurs within a specifiable area and time frame. The extent of species habitat affected can generally be quantified before the activity occurs. Operation of equipment to implement the non-flow-related activities described above will result in the temporary or permanent removal of existing habitat for covered species. Maintenance activities associated with navigation aids, boat ramps, and boat docks, and with artificial fish habitat structures, could alter river and reservoir structure, but the area affected by these activities would likely be only a fraction of an acre individually and only a few acres cumulatively.

Indirect effects of physical disturbances that could be associated with implementing non-flow-related covered activities include:

- temporary removal of food organisms and cover from the dredged areas of river channel and backwaters;
- reduction in channel-edge complexity, with a subsequent reduction of cover used by covered fish species to hide and escape from predators and of the production of invertebrates that are food for fish (Hicks et al. 1991), resulting from placement of riprap and the removal of shoreline vegetation;
- movement and potential accumulation of selenium and other metals due to channel maintenance, dredging, and dredge spoil placement; and
- potential sedimentation of covered fish species' spawning habitat, resulting from increased turbidity caused by channel dredging activities and construction and maintenance of fish grow-out coves, fishing docks, fish attraction structures, and boat ramps in Lake Mead and Lake Mohave.

In addition, activities causing physical disturbance potentially introduce contaminants into the air, soil, and water. Potential contaminants include fertilizers, pesticides, paint, and petroleum products. The introduction of contaminants generally occurs during ongoing disturbance, such as occurs with construction and maintenance activities. Activities at intervals shorter than 1 year that introduce contaminants potentially have adverse effects on survival and growth, cumulatively affecting abundance, distribution, and production of species populations.

5.3.1.2 Biological Disturbance

All construction and maintenance activities would result in biological disturbance—the intentional or unintentional removal or displacement of individual organisms. Biological disturbances associated with these activities could be manifested in the location where the activities are undertaken or on adjacent lands. Biological disturbance may be temporary or permanent and includes effects on behavior. For example, operation of equipment in habitat occupied by covered species could cause direct mortality of or physical trauma to individuals (e.g., entrainment of fish in dredge intakes), and noise and visual disturbances associated with operation of equipment could cause covered wildlife and fish species to move from the area of disturbance. These disturbances may also physically affect the individual organisms, for example through the bio-accumulation of selenium.

5.3.2 Assumptions

The non-flow-related covered activities described in Chapter 2, "Description of Federal Actions (Covered Activities)," and in Chapter 3, "Non-Federal Covered Activities: Ongoing and Future," identify the types of Federal and non-Federal non-flow-related activities, respectively, that may be undertaken over the term of the LCR MSCP. The assessment of non-flow-related impacts is based on the extent of species habitat that would be removed with implementation of the non-flow-related covered activities and a qualitative assessment of the likelihood that implementation of covered activities will result in harassment or direct mortality of covered species. The timing of implementation of the proposed non-Federal non-flow-related activities is not known at this time, and it is possible that some of the proposed activities may not be implemented within the term of the LCR MSCP, depending on whether the need to implement them develops as currently predicted. In addition, ongoing and future non-Federal activities related to conducting listed species surveys and capturing and handling species will be undertaken by qualified biologists authorized to conduct such activities under section 10(a)(1)(A) permits and, therefore, are not effects of and are not assessed in the LCR MSCP BA.

The assessment of Federal non-flow-related effects assumes that, to the extent practicable:

- Ground-disturbing activities associated with maintaining and restoring habitats will avoid effects on the sticky buckwheat and threecorner milkvetch.
- A total of 1,146 miles of existing and planned drains and canals on Tribal lands is maintained such that emergent vegetation does not become established and, therefore, does not support Yuma clapper rail, western least bittern, and California black rail habitat. Consequently, these activities will not affect these species and avoidance of maintenance activities during the breeding season is not required.
- Habitat restoration projects will avoid removing desert pocket mouse habitat to restore habitat for other species.
- Covered activities will be implemented to avoid the breeding season of all covered bird species to prevent injury or mortality of eggs and young birds unable to avoid these activities.

- Implementation of the habitat restoration projects will avoid take of individual desert tortoises and their burrows.
- Implementation of the non-flow-related covered activities would result in the removal of land cover types that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types on dry upland sites) by individuals of one or more covered species, but are not considered to be habitat . Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood of incidental take of covered species that could be associated with removal of these land cover types.

The assessment of non-Federal non-flow-related effects assumes that, to the extent practicable:

- Activities associated with OM&R of hydroelectric generation and transmission facilities will avoid impacts on covered species.
- A total of 234 miles of canals in the Yuma Valley, Arizona, that are currently maintained by the Yuma County Water Users Association will continue to be maintained such that emergent vegetation does not become established and, therefore, does not support Yuma clapper rail, western least bittern, or California black rail habitat. Consequently, these activities will not affect these species, and avoidance of maintenance activities during the breeding season is not required.
- Ongoing maintenance of 557 miles of canals, drains, and other water conveyance features in California and Arizona by water districts will include the periodic removal of patches of marsh vegetation that may become established in canals, drains, and other water conveyance features. Because of their design, only small patches of emergent vegetation are likely to become established in the 313 miles of canals and their periodic removal would have negligible effects on associated covered species. Periodic maintenance of 244 miles of drains however, are assumed to remove up to 30 acres of emergent vegetation.
- Sites for habitat restoration (including new infrastructure necessary to access or maintain restored habitat) covered activities will, to the extent practicable, be selected to avoid removal of existing cottonwood-willow, marsh, honey mesquite, and backwater land cover types that provide habitat for covered and evaluation species. Over the term of the LCR MSCP, however, some degraded covered species habitat could be removed to restore higher-value habitat for other species. The assessment of impacts on covered species assumes that habitat restoration projects will avoid removing honey mesquite type III land cover and, over the term of the LCR MSCP, could remove up to:
  - 10 acres of degraded and low-value cottonwood-willow land cover, types III and IV (types I and II will not be removed);
  - 10 acres of degraded and low-value marsh land cover; and
  - 10 acres of honey mesquite, type IV (type III will not be removed).
- Implementation of the non-Federal non-flow-related covered activities (primarily those related to restoring habitat) would result in the removal of land cover types that may support some transitory or minor level of use (predominantly saltcedar and

mixed saltcedar communities) by individuals of one or more covered species, but that do not constitute habitat under the LCR MSCP species habitat models. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood of incidental take of covered species that could be associated with removal of these land cover types.

- Habitat restoration projects will avoid removing desert pocket mouse habitat to restore habitat for other species.
- Ground-disturbing activities associated with OM&R of dams, diversions, powerlines and other water conveyance and hydroelectric generation facilities, including existing access and service roads, docks, boat ramps, and protected banklines that support OM&R of these facilities will not remove covered species habitat.
- Ground-disturbing activities associated with maintaining and creating habitats will avoid impacts on sticky buckwheat and threecorner milkvetch.
- Covered activities will be implemented to avoid the breeding season of all covered bird species to prevent injury or mortality of eggs and young birds unable to avoid these activities.
- Implementation of the habitat creation projects will avoid take of individual desert tortoises and their burrows.

5.4 Assessment of LCR MSCP Implementation Effects

LCR MSCP conservation measures are described in Chapter 5, "Conservation Plan" of the companion LCR MSCP HCP. The LCR MSCP conservation measures are intended to be beneficial to the covered and evaluation species. However, implementation of some conservation measures to create covered species habitats may have short-term adverse effects during construction or prior to development of habitat values. In addition, activities that benefit one covered species may be detrimental to other covered species. Activities that will be undertaken to maintain created habitats over the term of the LCR MSCP, such as dredging marshes and removing cottonwood trees to maintain habitat structure, may also have short-term adverse effects on covered species. The purpose of this section is to identify potential adverse effects on covered and evaluation species of implementing LCR MSCP conservation measures. Beneficial effects of implementing LCR MSCP conservation measures are described in the LCR MSCP Conservation Plan.

This section describes the mechanism through which implementation of the Conservation Plan could impact covered species and the assumptions used to conduct the assessment of those impacts.

5.4.1 Impact Mechanisms

The primary impact mechanisms related to LCR MSCP conservation measures are physical disturbance, biological disturbance, and irrigation drainage associated with establishing and managing created covered species habitats. The effects of physical disturbance and biological disturbance are the same as described for non-flow-related activities (see Section 5.3.1).

Drainage is the removal of excess surface water from a land surface by means of surface or subsurface drains and subsequent discharge to rivers, reservoirs, or backwaters (Nevada Division of Water Planning 1996). Drainage flow in the LCR MSCP planning area is primarily surface or subsurface runoff and return flows from irrigated agricultural lands. Conversion of existing land cover types to create covered species habitat could include irrigation of new lands, changes in irrigation patterns on existing irrigated lands, and potential additional changes in input of surface or subsurface flows and contaminants to the river and reservoirs. Expected changes in drainage volume associated with creation of 8,132 acres of habitat, or 3 percent of the total agricultural lands present in the LCR MSCP planning area, have not been quantified but are not expected to exceed 3 percent of the existing volume of agricultural drainage.

5.4.2 Assumptions

The LCR MSCP conservation measures described in the LCR MSCP Conservation Plan (see Chapter 5 of the LCR MSCP HCP) identify the types and extent of covered species habitat to be created but do not describe specific locations where the conservation measures would be implemented. The assessment of impacts of LCR MSCP conservation measures, therefore, is qualitative and based on the types of effects that such activities would likely have on covered and evaluation species if the activities are implemented in their habitat.

The timing of implementation of specific LCR MSCP conservation measures is not known at this time. It is the intent of the Applicants, however, to implement the LCR MSCP as quickly as is permitted by efficient staffing, funding, and the time required to conduct necessary research relative to creating covered species habitats and required to evaluate and acquire lands that are suitable for creating covered species habitat. Within these constraints, it is also the intent of the Permit Applicants to replace covered species habitat potentially affected by covered activities in advance of the implementation of covered activities.

LCR MSCP activities related to conducting species surveys and capturing and handling species will be undertaken, at the direction of the LCR MSCP Program Manager, by qualified biologists authorized to conduct such activities under section 10(a)(1)(A) permits and, therefore, are not effects of and not assessed in the LCR MSCP BA. LCR MSCP conservation measures that provide funds to other conservation programs and to management agencies to implement measures to benefit LCR MSCP covered species, including the maintenance of existing covered species habitats, will also be undertaken by qualified biologists authorized to conduct such activities under section 10(a)(1)(A) permits and, therefore, are not effects of and not assessed in the LCR MSCP BA.

The assessment of LCR MSCP effects assumes that, to the extent practicable:

- Sites for habitat creation will be selected to avoid removal of existing cottonwood-willow, marsh, honey mesquite, and backwater land cover types that provide habitat for covered and evaluation species. Temporary disturbance of habitat and direct impacts on covered species, however, may be associated with creating habitats and subsequent habitat maintenance activities (e.g., controlled burning in marshes and removal of trees to maintain succession objectives on created habitat).
- LCR MSCP conservation measures will be implemented to avoid the breeding season of all covered bird species to prevent injury or mortality of eggs and young birds unable to avoid these activities.
- Sites for habitat creation will be selected to avoid removal of occupied southwestern willow flycatcher habitat.
- Implementation of the LCR MSCP Conservation Plan will avoid take of individual desert tortoises and their burrows.
- Ground-disturbing activities associated with maintaining and creating habitats will avoid impacts on sticky buckwheat and threecorner milkvetch.

The assessment of LCR MSCP effects also assumes that, in addition to 8,132 acres of land that will be required to create covered species habitats, 81 acres (i.e., 1 percent of the total extent of LCR MSCP created habitat) will be required for construction of new infrastructure in support of the created habitats (i.e., a total of 8,213 acres of land will be needed to establish and maintain created covered species habitats). Based on current LCR MSCP estimates, the impact assessment assumes the following.

- Approximately two-thirds of LCR MSCP created habitat and associated infrastructure would be created on agricultural lands (4,964 acres). Agricultural lands provide little or no habitat value for covered and evaluation species.
- Up to 512 acres of existing degraded or former marsh that may provide low-value habitat could be converted to create fully functioning marsh that provides high-value Yuma clapper rail, western least bittern, California black rail, and Colorado River cotton rat habitat. Conversion of existing degraded or former marsh to create habitat for these species, however, will not result in a loss of existing habitat. If individuals of these species are present in affected marshes, implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan would reduce the likelihood and level of take.
- Up to 360 acres of existing degraded or former backwaters that may provide low-value habitat could be converted to create fully functioning backwaters that provides high-value bonytail, razorback sucker, and flannelmouth sucker habitat. Conversion of existing degraded or former backwaters to create habitat for these species, however, will not result in a loss of existing habitat.
- Approximately 2,377 acres (based on the previous three assumptions) of covered species habitat will be created on additional lands that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals of one or more covered species, but are not considered to be habitat . These land cover types would be lost and replaced with habitats designed to be of

higher value for the covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood of incidental take of covered species that could be associated with removal of these land cover types.

5.5 Effects on Covered Species

Effects of implementing the covered activities and the LCR MSCP Conservation Plan on covered species are the effects of actions that result in the taking of a covered species as defined under the ESA. Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct" with respect to Federally listed species (ESA 3[9] and 50 C.F.R. §17.31(a)). The USFWS further defines "harm" to include the significant modification or degradation of habitat that results in the death or injury to a species by significantly impairing behavioral patterns, such as breeding, feeding, or sheltering (50 C.F.R. §17.3). "Harass" is defined as performing actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavioral patterns, which include, but are not limited to, breeding, feeding or sheltering (50 C.F.R. §17.3).

Table 5-4 identifies the covered activities that could adversely affect the covered species. Table 5-5 summarizes the estimated extent of covered and evaluation species habitat that could be degraded or removed as a result of implementing covered activities and the LCR MSCP Conservation Plan. The following sections describe the effects of implementing the Federal non-flow- and flow-related covered activities and LCR MSCP conservation measures on each of the covered and evaluation species. The effects of implementing non-Federal non-flow-related covered activities are described in Section 5.6, "Effects of Non-Federal Non-Flow-Related Covered Activities."

5.5.1 Yuma Clapper Rail

Implementation of the covered activities and LCR MSCP conservation measures could affect a substantial proportion of Yuma clapper rail habitat throughout its present range over the term of the LCR MSCP. The effects of covered activities and LCR MSCP conservation measures on the distribution and status of the Yuma clapper will be minimized through implementation of LCR MSCP avoidance and minimization measures and creation of habitat to replace affected habitat. Creation of habitat in addition to that required to replace lost habitat, through implementation of the LCR MSCP Conservation Plan, is expected to contribute to recovery of the Yuma clapper rail. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the Yuma clapper rail.

5.5.1.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the Yuma clapper rail. Changes in points of diversion in Reaches 3–5 will lower groundwater levels sufficiently in these reaches to

reduce the extent or quality of 133 acres of Yuma clapper rail habitat (see Table 5-5) provided by marshes associated with backwaters. Reservoir elevations in Reaches 3–5 would not be affected by lower river stage elevations. Consequently, flow-related activities are not expected to affect habitat associated with marshes maintained by reservoirs (e.g., Bill Williams Delta [Reach 3]) or that are managed to support marsh vegetation (e.g., Imperial NWR [Reach 5]). The LCR MSCP will avoid the potential effects of lowering groundwater elevations on an additional 16 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh, thereby maintaining water levels and existing habitat conditions (see Table 5-3). Lowering groundwater elevations could cause direct loss of these habitats by desiccating, fragmenting, or reducing the extent of habitat patches.

As described in Section 5.2.3.3, implementation of flow-related covered activities may affect marsh vegetation that provides Yuma clapper rail habitat that may periodically establish at inflow points of Lake Mead (e.g., Colorado River delta, Virgin River delta, Muddy River delta, Las Vegas Wash) when Lake Mead water surface elevations are below full pool elevation. Marsh habitat below the full pool elevation will be created and lost based on water surface elevations. For example, marsh vegetation established at a certain elevation may be lost if the water surface elevation declines so that groundwater elevations drop below the rooting depths of emergent vegetation. Alternatively, established marsh vegetation would be inundated and lost during wetter periods, when Lake Mead reservoir elevations rise. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations over the term of the LCR MSCP cannot be predicted based on the available information. The periodic loss of these ephemeral marshes, however, could result in a low level of take of Yuma clapper rail over the term of the LCR MSCP.

As described in Section 5.2.2.3, effects of ongoing flow-related covered activities in Reaches 3–5 could contribute to a minimal and unquantifiable level of degradation of marshes that provide habitat over the term of the LCR MSCP.

5.5.1.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration and maintenance projects; conversion of lands to agriculture) may result in take of Yuma clapper rail. Noise, artificial lighting, and dust may have indirect effects well beyond the construction areas on nesting Yuma clapper rails. Effects may include displacement of nesting pairs or decreased reproductive success. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. These activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 70 acres of Yuma clapper rail habitat could be removed to maintain channel functions (e.g., dredging desilting basins) (see Table 5-5). Activities associated with

Table 5-4. Covered Activities that could Adversely Affect Covered Species

Common and Scientific Name	Flow-Related Covered Activities		Non-Flow-Related Covered Activities		LCR MSCP
	Ongoing	Future	Ongoing	Future	
Threatened and Endangered Species					
Yuma clapper rail *Rallus longirostris yumanensis*	X	X	X	X	X
Southwestern willow flycatcher *Empidonax trailii extimus*	X	X	X	X	X
Desert tortoise (Mojave population) *Gopherus agassizii*			X	X	X
Bonytail *Gila elegans*	X	X	X	X	X
Humpback chub *Gila cypha*	X	X			
Razorback sucker *Xyrauchen texanus*	X	X	X	X	X
Other Covered Species					
Western red bat *Lasiurus blossevillii*	X	X	X	X	X
Western yellow bat *Lasiurus xanthinus*	X	X	X	X	X
Desert pocket mouse *Chaetodipus penicillatus sobrinus*			X	X	X
Colorado River cotton rat *Sigmodon arizonae plenus*	X	X	X	X	X
Yuma hispid cotton rat *Sigmodon hispidus eremicus*			X	X	X
Western least bittern *Ixobrychus exilis hesperis*	X	X	X	X	X
California black rail *Laterallus jamaicensis coturniculus*	X	X	X	X	X
Yellow-billed cuckoo *Coccyzus americanus occidentalis*	X	X	X	X	X
Elf owl *Micrathene whitneyi*	X	X	X	X	X
Gilded flicker *Colaptes chrysoides*	X	X	X	X	X
Gila woodpecker *Melanerpes uropygialis*	X	X	X	X	X
Vermilion flycatcher *Pyrocephalus rubinus*	X	X	X	X	X

Common and Scientific Name	Flow-Related Covered Activities		Non-Flow-Related Covered Activities		LCR MSCP
	Ongoing	Future	Ongoing	Future	
Arizona Bell's vireo *Vireo bellii arizonae*	X	X	X	X	X
Sonoran yellow warbler *Dendroica petechia sonorana*	X	X	X	X	X
Summer tanager *Piranga rubra*	X	X	X	X	X
Flat-tailed horned lizard *Phrynosoma mcalli*			X	X	X
Relict leopard frog *Rana onca*	X	X			
Flannelmouth sucker *Catostomus latipinnis*	X	X	X	X	X
MacNeill's sootywing skipper *Pholisora gracielae*	X	X	X	X	X
Sticky buckwheat *Eriogonum viscidulum*	X	X			
Threecorner milkvetch *Astragalus geyeri* var. *triquetrus*	X	X			
California leaf-nosed bat *Macrotus californicus*					
Pale Townsend's big-eared bat *Corynorhinus townsendii pallescens*					
Colorado River toad *Bufo alvarius*					
Lowland leopard frog *Rana yavapaiensis*					

Table 5-5. Summary of Estimated Extent of Covered Species Habitat Affected with Implementation of the Covered Activities, Including Reduction in Annual Flow of 0.860 Million Acre-Feet in Reach 3 and of 1.574 Million Acre-Feet in Reaches 4 and 5 (acres)

Covered Species	Impacts on Species Habitat			
	Degraded (Flow-Related)	Federal Non-Flow-Related Activities	State Non-Flow- Related Activities	Total[a]
Threatened and Endangered Species				
Yuma clapper rail	133	70	40[b]	243
Southwestern willow flycatcher	1,784	59	10	1,853
Desert tortoise (Mojave population)	0	192	0	192
Bonytail	399	0	0	399
Humpback chub	ND[c]	0	0	ND[c]
Razorback sucker	399	0	0	399
Other Covered Species				
Western red bat	161	604	0	765
Western yellow bat	161	604	0	765
Desert pocket mouse	0	0	0	0
Colorado River cotton rat	59	3	5[d]	67
Yuma hispid cotton rat	0	71	5[e]	76
Western least bittern	133	70	40[b]	243
California black rail	37	31	35[f]	103
Yellow-billed cuckoo	1,425	99	10[g]	1,534
Elf owl	161	590	0	751
Gilded flicker	1,425	99	10[g]	1,534
Gila woodpecker	819	26	10[g]	855
Vermilion flycatcher	1,890	714	10[g]	2,614
Arizona Bell’s vireo	1,654	1,309[h]	20[i]	2,983

Covered Species	Impacts on Species Habitat			
	Degraded (Flow-Related)	Federal Non-Flow-Related Activities	State Non-Flow- Related Activities	Total[a]
Sonoran yellow warbler	2,929	183	10[g]	3,122
Summer tanager	161	14	0	175
Flat-tailed horned lizard	0	128	0	128
Relict leopard frog	0[j]	0	0[j]	0[h]
Flannelmouth sucker	85	0	0	85
MacNeill's sootywing skipper	172	50	0	222
Sticky buckwheat	ND[k]	0	0	ND[k]
Threecorner milkvetch	ND[k]	0	0	ND[k]
Evaluation Species				
California leaf-nosed bat	0	0	0	0
Pale Townsend's big-eared bat	0	0	0	0
Colorado River toad	0	0	0	0
Lowland leopard frog	0	0	0	0

Note: LCR MSCP conservation measures to create habitat for covered species will avoid removal of cottonwood-willow, honey mesquite, marsh, and backwater land cover types that provide habitat for covered species, and, therefore, impacts of implementing the LCR MSCP conservation measures are not shown in this table. The LCR MSCP currently estimates that about two-thirds of LCR MSCP created habitat would be created on agricultural lands (5,045 acres), including associated infrastructure (estimated to be 1% of all habitat created, or 81 acres). Agricultural lands provide little or no habitat value for covered and evaluation species.

The LCR MSCP impact assessment also assumes that up to 512 acres of existing degraded or former marsh that may provide low-value habitat could be converted to create fully functioning marsh that provides high-value Yuma clapper rail, western least bittern, California black rail, and Colorado River cotton rat habitat. Up to 360 acres of existing degraded or former backwaters could also be converted to create fully functioning backwaters that provides high-value habitat for the bonytail, razorback sucker, and flannelmouth sucker. Conversion of existing degraded or former marsh and backwaters to create habitat for these species, however, will not result in a loss of existing habitat. The remainder of LCR MSCP habitat (currently estimated to be 2,377 acres) would be created on additional lands that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals of one or more covered species, but are not considered to be habitat . These land cover types would be lost and replaced with habitats designed to be of higher value for the covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood of incidental take of covered species that could be associated with removal of these land cover types.

[a] Includes the impacts of implementing Federal covered activities, and state non-flow-related covered activities on covered species habitats.

[b] Includes the potential for periodic removal of up to 30 acres of emergent vegetation that could provide habitat along 244 miles of drains and for removal of up to 10 acres of degraded marsh land cover that could provide low-value habitat for this species could be restored as wildlife habitat for other species over the term of the LCR MSCP.

[c] ND = Not determined. Acres of potentially affected habitat are not calculated. Changes in reservoir elevations associated with implementation of flow-related covered activities, however, could result in the establishment of up to 62 miles of transitory Colorado River channel (when the reservoir pool is maintained at lower elevations) that could be occupied by humpback chub and subsequently lost when reservoir elevations rise.

[d] Assumes that up to 5 acres of degraded marsh land cover that could provide low-value habitat for this species could be restored in Reaches 3 and 4 as wildlife habitat for other species over the term of the LCR MSCP.

[e] Assumes that up to 5 acres of degraded cottonwood-willow land cover that could provide low-value habitat for this species could be restored in Reaches 6 and 7 as wildlife habitat for other species over the term of the LCR MSCP.

[f] Includes the potential for periodic removal of up to 30 acres of emergent vegetation that could provide habitat along 244 miles of drains and for removal of up to 5 acres of degraded marsh land cover that could provide low-value habitat for this species could be restored as wildlife habitat for other species over the term of the LCR MSCP.

[g] Assumes that up to 10 acres of degraded cottonwood-willow land cover that could provide low-value habitat for this species could be restored as wildlife habitat for other species over the term of the LCR MSCP.

[h] Includes 610 acres of honey-mesquite, type IV (which provides Arizona Bell's vireo habitat), that could be converted to agricultural uses and that are covered under the LCR MSCP. Up to an additional 3,832 acres of honey-mesquite type IV that provide habitat could be removed by Federal non-flow-related activities; however, these activities and resultant impacts are not covered under the LCR MSCP.

[i] Assumes that up to 10 acres of degraded cottonwood-willow and honey-mesquite type IV land cover that could provide low-value habitat for this species could be restored as wildlife habitat for other species over the term of the LCR MSCP.

[j] Implementation of covered activities will not result in removal of this species' habitat but could temporarily disturb habitat or affect movement of individuals.

[k] ND = Not determined. Acres of potentially affected habitat are not calculated. Changes in Lake Mead reservoir elevations associated with implementation of flow-related covered activities, however, would result in periodic loss of habitat that is exposed along the Lake Mead shoreline when reservoir elevations are low, and then is subsequently inundated when reservoir elevations rise.

removal of habitat during the breeding season could result in mortality of eggs or young. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. As described in Section 5.2.2.3 , indirect effects of ongoing non-flow-related covered activities in Reaches 2–7 could contribute to a minimal and unquantifiable level of degradation of marshes that provide habitat over the term of the LCR MSCP.

The creation of Yuma clapper rail habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of Yuma clapper rail in the LCR MSCP planning area. Consequently, the number of Yuma clapper rails exposed to disturbances caused by these types of non-flow-related activities is expected to increase in future years.

5.5.1.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining backwaters and marsh as habitat for covered species in Yuma clapper rail habitat may result in take of Yuma clapper rail. LCR MSCP habitat creation–related activities could result in temporary disturbance of habitat and harassment of individuals if they are present at the time activities are implemented, but these activities would avoid removing primary habitat to establish habitat for other covered species. Up to 512 acres of existing degraded or former marsh that may provide low-value habitat could be converted to fully functioning marsh that provides high-value Yuma clapper rail habitat. Some additional limited and low-value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) could be converted to habitat to benefit other covered species; however, with implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, removal of these low-quality habitats is not expected to result in harm (i.e., injury or mortality of individuals) and, therefore, is not expected to result in take of Yuma clapper rail.

Habitat management–related activities, such as operating equipment to remove vegetation and maintain open water in backwaters and burning decadent marsh vegetation to stimulate vegetation growth, could result in temporary loss of habitat and harassment of individuals. To the extent practicable, these activities would be conducted when nesting adults and young birds are not present, to avoid injury or mortality. The LCR MSCP would avoid removing habitat to establish habitat for other covered species. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 512 acres (i.e., the extent of marsh land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood of take is expected to increase over the term of the LCR MSCP if the abundance of Yuma clapper rail increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities undertaken in species habitat.

Implementation of the LCR MSCP Conservation Plan will create 512 acres of Yuma clapper rail habitat to replace habitat that could be lost as a result of covered activities

and will increase the amount of new habitat by 269 acres. In addition, the LCR MSCP Conservation Plan will maintain existing important Yuma clapper rail habitat areas in the LCR MSCP planning area.

5.5.2 Southwestern Willow Flycatcher

Implementation of the covered activities and LCR MSCP conservation measures could affect a substantial proportion of southwestern willow flycatcher habitat throughout its present range over the term of the LCR MSCP. The effects of covered activities and LCR MSCP conservation measures on the distribution and status of the southwestern willow flycatcher will be minimized with implementation of LCR MSCP avoidance and minimization measures and the creation of habitat to replace affected habitat. Creation of habitat in addition to that required to replace lost habitat with implementation of the LCR MSCP Conservation Plan is expected to contribute to recovery of the southwestern willow flycatcher. For the reasons described below, implementation of the flow-related and non-flow-related covered activities and the LCR MSCP is likely to adversely affect the southwestern willow flycatcher. Implementation of the covered activities could impact proposed southwestern willow flycatcher critical habitat. These impacts, however, are not expected to appreciably diminish the value of the proposed critical habitat for species conservation.

5.5.2.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of southwestern willow flycatcher. Changes in points of diversion in Reaches 3–5 will lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 1,784 acres of occupied (1,643 acres) and unoccupied (141 acres) southwestern willow flycatcher habitat (see Table 5-6). Lowering groundwater elevations will affect breeding habitat primarily through the loss of moist soil surface conditions during the breeding season. The LCR MSCP will avoid the potential effects of lowering groundwater elevations on an additional 2,135 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh and thereby maintaining water levels and existing conditions (see Table 5-3). Southwestern willow flycatcher nesting habitat is assumed to be lost if the predicted reduction of groundwater elevation caused by changes in points of diversion is sufficient to result in the loss of surface water or moist soil surface conditions in nesting habitat during the breeding season.

Table 5-6. Reduction in Extent of Southwestern Willow Flycatcher Habitat (1996–2001) by Land Cover Type (0.860-million-acre-foot flow reduction in Reach 3 and 1.574-million-acre-foot flow reduction in Reaches 4 and 5)

	Reach			
Habitat Status	3	4	5	Total
Occupied	168	187	1,288	1,643
Unoccupied	12	102	27	141
Total	**180**	**289**	**1,315**	**1,784**

As described in Section 5.2.3.3, riparian vegetation that could provide habitat for the southwestern willow flycatcher may establish as Lake Mead reservoir elevations change over the term of the LCR MSCP at the Lake Mead delta, Virgin River delta, Muddy River delta, and the portion of the Grand Canyon influenced by Lake Mead. However, the amount, type, quality, and longevity of this habitat depends on how much soil is exposed, the quality of the soil, when draw downs occur, and how long habitat is exposed and/or inundated. Hydrologic modeling (see Appendix J) predicts that Lake Mead elevations will fluctuate between full level and progressively lower levels during the 50 year period of analysis. Therefore, there may be a possible benefit from the proposed action, because of fluctuations in Lake Mead, willow flycatcher habitat will develop at the Colorado, Muddy, and Virgin River deltas of Lake Mead. Yet, it is unknown how long this habitat will persist, if it develops at all. Reclamation has already consulted on the effects of the loss of southwestern willow flycatcher habitat within the influence of Lake Mead (U.S. Fish and Wildlife Service 1997) and provided replacement habitat to offset the periodic loss of this area. Thus, the southwestern willow flycatcher may obtain a temporary benefit from having this habitat occasionally available.

As described in Section 5.2.2.3, effects of ongoing flow-related covered activities in Reaches 3–5 could contribute to a minimal and unquantifiable level of degradation of habitat over the term of the LCR MSCP.

5.5.2.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gauge station, and other facility maintenance activities; implementation of marsh and riparian restoration and maintenance projects; conversion of lands to agriculture) near occupied southwestern willow flycatcher nesting territories could result in harassment of individuals. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting southwestern willow flycatchers. Effects may include displacement of nesting pairs or decreased reproductive success. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. These activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 59 acres of southwestern willow flycatcher habitat could be removed and converted to agriculture at the Cocopah Indian Reservation in Reach 7 (see Table 5-5). Activities associated with removal of occupied habitat during the breeding season could result in mortality of eggs or nestlings. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. These activities are expected to result in some low level of take over the term of the LCR MSCP. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., dry patches of saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3 indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of habitat degradation in Reaches 2–7 over the term of the LCR MSCP.

The creation of southwestern willow flycatcher habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increased number and distribution of southwestern willow flycatchers in the LCR MSCP planning area. Consequently, the number of southwestern willow flycatchers exposed to disturbances caused by non-flow-related activities is expected to increase in future years.

5.5.2.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining covered species habitat may result in take of southwestern willow flycatcher. LCR MSCP habitat creation–related activities could result in temporary disturbance of habitat and harassment of individuals if they are present at the time activities are implemented, but these activities would avoid removing primary southwestern willow flycatcher habitat to establish habitat for other covered species.

Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., dry patches of saltcedar and saltcedar-dominated land cover types) by individuals, could be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take that could be associated with removal of these land cover types.

Habitat management–related activities, such as periodic removal of trees in patches of created habitat to encourage the development of multiage stands of trees and to maintain edge habitat, as well as operation of equipment to maintain roads, could result in temporary loss of habitat and harassment of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 5,940 acres (i.e., the extent of cottonwood-willow land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood of take is expected to increase over the term of the LCR MSCP if the abundance of southwestern willow

flycatcher increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

Implementation of the LCR MSCP Conservation Plan will create at least 4,050 acres of southwestern willow flycatcher habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of available nesting habitat by 2,197 acres. LCR MSCP–created yellow-billed cuckoo habitat that maintains wet soil conditions during the southwestern willow flycatcher breeding season could provide additional habitat for the species. In addition, the LCR MSCP Conservation Plan will maintain baseline important southwestern willow flycatcher habitat areas in the LCR MSCP planning area.

5.5.2.4 Effects on Proposed Critical Habitat

On October 12, 2004, the USFWS proposed critical habitat for the southwestern willow flycatcher (69 FR §60706). This section describes the areas proposed for critical habitat and the effects of covered activities and the LCR MSCP on proposed critical habitat. The analysis of effects on critical habitat does not rely on USFWS's regulatory definition of "destruction or adverse modification" of critical habitat found at 50 C.F.R. §402.02. Instead, this BA relies upon the analysis set forth in *Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service*, F.3d (9th Circuit 2004)[5]

Critical habitat has been proposed within Reaches 1 and 3–6. Distinct reaches within the planning area include: 1) Reach 1: lower Grand Canyon from Separation Canyon to Pierce Ferry, including a small portion of upper Lake Mead, a small portion of the Virgin River Delta, and a small portion of the Muddy River Delta as it enters Lake Mead; 2) Reach 3 and 4: Davis dam to Parker Dam including Lake Havasu and Topock Marsh, a portion of the Bill Williams River as it enters Lake Havasu, and Parker Dam to Upper end of the Colorado River Indian Tribe reservation; and 3) entire length of Reach 5 and a portion of Reach 6 extending to a point 3.5 miles north of the Gila/Colorado River confluence.

Implementation of the covered activities and the LCR MSCP will not result in an appreciable diminishment of the value of the proposed critical habitat for conservation of the southwestern willow flycatcher for reasons listed below.

The first distinct reach affected by flow related covered activities is the lower Grand Canyon from Separation Canyon to Pierce Ferry and the Virgin River. This area supports the majority of woody riparian vegetation found within Reach 1 when reservoir elevations are below the full pool elevation of Lake Mead.

Southwestern willow flycatcher breeding has been documented intermittently within the lower Grand Canyon and Pierce Ferry section of Lake Mead since 1996. In 1997, 981 acres of occupied or surveyed but unoccupied habitat were delineated within Reach 1

[5] The 9th circuit indicated that the statute requires that effects on critical habitat be evaluated in light of recovery of the species, and not just survival of the species.

(see Table 4-11). Potential willow flycatcher habitat has not been delineated in the Lake Mead delta since that time. Recent declines in reservoir elevations have subsequently resulted in the loss of newly created habitat as a result of desiccation.

The extent and composition of the riparian vegetation at any point in time is highly dependent on Lake Mead reservoir fluctuations. Consequently, southwestern willow flycatcher habitat conditions provided by riparian vegetation that establishes within the full pool elevation of Lake Mead are directly related to Lake Mead elevations. Historically, riparian vegetation has been created, destroyed, or altered within the full pool elevation of Lake Mead intermittently, depending on external factors, including inflow from the Upper Basin. High water levels at Lake Mead can eliminate habitat within the lake proper but may improve habitat within portions of Grand Canyon below Separation Canyon. Conversely, low lake levels can create conditions suitable for the establishment of habitat below the full pool elevation of Lake Mead; however, habitat quality is highly variable and dependent upon many factors including timing and extent of reservoir drawdowns.

The second distinct reach includes all of Reach 3 of the LCR MSCP planning area, including Topock Marsh, which is one major stronghold of the species along the LCR where breeding pairs have been located every year since 1996. A total of 3,489 acres of occupied and surveyed but unoccupied willow flycatcher habitat has been estimated to occur in Reach 3 (see Table 4-11). Approximately a 17 mile section of Reach 4 south of Parker Dam is also proposed for critical habitat. Little habitat currently exists in the northern section of this reach; however, 55 acres of occupied habitat have been identified and proposed as critical habitat on CRIT lands near Parker.

Flow-related covered activities are expected to affect a total of 180 acres (168 acres of occupied and 12 acres of unoccupied habitat) (see Table 5-6) of proposed critical habitat in Reach 3 and 55 acres in Reach 4, because lower groundwater levels associated with water diversions could increase the desiccation of existing habitat. The LCR MSCP will avoid the potential effects of lowering groundwater elevations on an additional 2,135 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh and thereby maintaining water levels and existing conditions (see Table 5-3). Any drop in groundwater elevation under the proposed critical habitat area is assumed to result in the degradation or loss of the vegetation that characterizes the constituent elements of the proposed critical habitat (see Section 5.2.1.3).

The third distinct reach proposed for critical habitat designation along the LCR is the entire length of Reach 5 and a portion of Reach 6 extending to a point 3.5 miles north of the Gila/Colorado River confluence. No nests have been located in this area, but sites are heavily used for migration. An estimated 1,315 acres (1,288 acres of occupied habitat and an additional 27 acres of unoccupied habitat) are expected to be affected by flow-related covered activities, within Reach 5 (see Table 4-11), and an additional 97 acres of occupied and unoccupied habitat within the portion of Reach 6. Estimated effects of flow-related covered activities on occupied and unoccupied but surveyed southwestern willow flycatcher habitat are described in Section 5.5.2.1. Effects to the habitat within areas proposed as critical habitat include the degradation of native vegetation and loss of moist surface soil conditions as a result of the lowering of groundwater elevations, removal of habitat as a result of conversion to agriculture, and desiccation or inundation

of habitat that establishes within the full pool elevation of Lake Mead as a result of fluctuations in reservoir elevations.

The proposed critical habitat designation also stresses the importance of the LCR as a migration corridor for southwestern willow flycatchers. Lower portions of the river below Parker are heavily used during migration as shown by surveys conducted since 1997. For example, in 2003, 244 migrant willow flycatchers (all subspecies of *Empidonax trailii*) were detected between Parker Dam and the SIB at the south end of Reach 7 (Koronkiewicz 2004), and over 240 migrant flycatchers were observed in these same reaches in 2004 (Koronkiewicz pers. comm.).

While willow flycatchers have been observed during migration in many areas within the LCR MSCP planning area, including backyards, important stopover habitat may be more restricted. Flow-related effects are unlikely to adversely affect marginal stopover migration habitat, such as that that may be provided by upland stands of saltcedar and saltcedar-mesquite land cover types. High value migration stopover habitat is provided by areas with the same vegetative and soil moisture characteristics that provides southwestern willow flycatcher habitat (e.g., dense woody vegetation riparian, moist surface soil conditions that produce an abundance of flying insects). Potential effects of implementing the covered activities on these habitat areas are the same as those described in Sections 5.5.2.1, 5.5.2.2, and 5.5.2.3).

The LCR MSCP includes conservation measures specific to creating and managing habitat for the southwestern willow flycatcher within the proposed critical habitat. The created habitat will be managed to provide higher value than the affected proposed critical habitat it will replace (e.g., the habitat will be managed to provide moist soils and nesting substrate of sufficient density structure).

Implementation of the LCR MSCP conservation measures would have a beneficial effect on the areas proposed for critical habitat in reaches below Davis Dam. The LCR MSCP will create 4,050 acres of cottonwood-willow land cover that will be managed specifically to provide the constituent elements of southwestern willow flycatcher breeding and migration habitat Preliminary data indicate that willow flycatchers can be relatively abundant during migration in restored riparian areas, especially if soil moisture conditions are adequate. For example, flycatcher surveys indicate that migratory flycatchers are using riparian restoration sites that were initiated in 1999 (i.e., the Pratt Restoration site near Yuma Arizona and the Cibola Nature Trail Restoration site on Cibola NWR; Bureau of Reclamation unpublished data 2004). Implementation of the LCR MSCP will enhance areas included in the critical habitat proposal and will not result in an appreciable diminishment of the value of the proposed critical habitat for conservation of the southwestern willow flycatcher.

In conclusion, implementation of the covered activities and the LCR MSCP will not diminish capacity of the proposed critical habitat present within the LCR MSCP planning area to a level that will preclude future achievement of the southwestern willow flycatcher recovery goals (U.S. Fish and Wildlife Service 2002b). In addition, the LCR MSCP provides for the continued adaptive implementation of the LCR MSCP conservation measures to further ensure that implementation of the covered activities will not diminish the value of critical habitat for conservation.

5.5.3 Desert Tortoise (Mojave Population)

The desert tortoise occurs in arid vegetation communities, typically in association with creosote bush scrub, that are not dependent on groundwater. Consequently, flow-related activities will not affect the desert tortoise and are, therefore, not expected to result in take or adverse modification of its designated critical habitat. The potential effects of implementing non-flow-related covered activities and LCR MSCP conservation measures on distribution and status of the Mojave population of desert tortoise are expected to be minor, potentially affecting a small number of individuals and small patches of habitat. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the desert tortoise. For the reasons described below, implementation of the non-flow-related covered activities and the LCR MSCP is likely to adversely affect the desert tortoise.

5.5.3.1 Effects of Federal Non-Flow-Related Covered Activities

Proposed activities related to conversion of lands to agricultural uses may result in take of the desert tortoise. Conversion of creosote-dominated desert scrub land cover to agricultural land in Reaches 4 and 6 would remove 192 acres of desert tortoise habitat (see Table 5-5), but would not affect designated critical habitat. Activities associated with conversion of habitat (ground-disturbing activities) could result in injury or mortality of individuals. These activities are expected to result in a low level of take over the term of the LCR MSCP. Ongoing non-flow related covered activities are not expected to result in indirect effects on the desert tortoise.

5.5.3.2 Effects of LCR MSCP Implementation

Activities associated with establishing and managing LCR MSCP–created covered species habitat may result in take of desert tortoise. Some or all LCR MSCP conservation areas that are established on the west side of the Colorado River in Reaches 2–6 could affect desert tortoise habitat. It is unlikely that LCR MSCP covered species habitats would be created in desert tortoise habitat because site conditions associated with tortoise habitat would likely be unsuitable for creation of covered species habitat. However, depending on existing infrastructure associated with conservation areas established in the desert tortoise range, the LCR MSCP may be required to construct and maintain roads, install and maintain utility lines, and construct other infrastructure in desert tortoise habitat that is necessary to establish and maintain the conservation areas. Such activities could result in removal and disturbance of habitat. The extent of habitat likely to be affected by these activities is expected to be minimal relative to the extent of existing habitat.

Injury or mortality of individual tortoises associated with implementing the LCR MSCP Conservation Plan, to the extent practicable, would be avoided. Over the term of the LCR MSCP, however, these activities (operation of vehicles and equipment in habitat) are expected to result in some low level of take (i.e., mortality) of individuals.

Implementation of the LCR MSCP Conservation Plan will protect 230 acres of unprotected occupied desert tortoise habitat to mitigate the loss of up to 192 acres of desert tortoise habitat as a result of implementing covered activities. The acquired habitat will be transferred to an appropriate management agency for permanent protection of habitat for the species.

5.5.3.3 Effects on Critical Habitat

In 1994, the USFWS proposed critical habitat for the desert tortoise. This BA does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat found at 50 C.F.R. §402.02. The definition of "destruction or adverse modification" found in this BA relies upon the ESA and the analysis found in *Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service*, F.3d, (9th Circuit 2004).

The Mojave population of desert tortoise is present in the LCR MSCP planning area in Reaches 1–6. Designated critical habitat for this subspecies is present in Reaches 1–4 of the planning area. Implementation of flow-related and Federal and non-Federal non-flow-related covered activities and LCR MSCP conservation measures will not affect designated critical habitat for desert tortoise.

5.5.4 Bonytail

Although the bonytail is known only to exist in the mainstem and connected backwaters in Reaches 2 and 3 and High Levee Pond in Reach 4, it may be reintroduced into Reaches 4 and 5 in future years under the LCR MSCP or other programs.

Implementation of the covered activities and LCR MSCP conservation measures would affect flows and water levels in a substantial proportion of bonytail habitat along the LCR (i.e., Reaches 3–5). The degree to which changes in points of diversion would affect the future distribution and status of bonytail in Reaches 3–5 compared to existing conditions is uncertain. The LCR MSCP Conservation Plan, however, includes conservation measures to replace affected bonytail habitat and stock bonytail in sufficient numbers over the term of the LCR MSCP to fully mitigate effects and contribute to recovery of the species. For the reasons described below, implementation of the flow-related and non-flow-related covered activities and the LCR MSCP is likely to adversely affect the bonytail. Implementation of the covered activities could impact bonytail critical habitat. These impacts, however, are not expected to appreciably diminish the value of critical habitat for species conservation.

5.5.4.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of bonytail. Changes in flow in Reaches 3–5 would result in the loss of 399 acres of habitat, including the designated critical habitat between the northern boundary of Havasu NWR and Lake Havasu (see Table 5-5). Although bonytail is known to exist only in the mainstem and connected backwaters of

Reaches 2 and 3 and in High Levee Pond in Reach 4, it may be reintroduced into Reaches 4 and 5 in future years under the LCR MSCP or other programs. The LCR MSCP would avoid the potential effects of lowering groundwater elevations on an additional 225 acres of bonytail habitat at Topock Marsh by maintaining water deliveries to Topock Marsh, thereby maintaining water levels and existing conditions.

Ongoing operations of reservoirs for hydropower generation result in river flow fluctuations that can vary substantially over a 24-hour period and could result in stranding or desiccation of bonytail. The potential for stranding or desiccation of bonytail to occur is governed by two primary factors. The first factor is the site specific channel morphology, including the presence of gravel and cobble bars, side channels, or shallow backwaters within the river reach affected by the fluctuating flows. The closer to the dam these physical channel features are located, the amount of water level fluctuation will be greater, since fluctuations attenuate downstream (see Appendix J) and water levels stabilize. The second factor is the current distribution and abundance of bonytail in the LCR MSCP planning area. The number of individual bonytail in the areas of greatest fluctuations is low, and most of the bonytail in the LCR do not inhabit areas subject to significant fluctuations.

Implementation of future flow-related covered activities would reduce river flow. Consequently, although river operations related to hydropower generation will not change (see Section 5.2.1.3), the range of high and low flows will be lower than under existing conditions. Changes to the water elevations below Davis Dam (Reach 3) and Parker Dam (Reach 4) are depicted in Table 5-2. These changes differ seasonally and range between –2.09 and –0.01 feet at Davis Dam and –2.46 and –0.21 feet at parker Dam. The pattern of fluctuations does not change, and once reduced flows are expressed, no additional changes to elevations would be expected. The end result of these changes is not substantial related to existing conditions. The change in the potential for stranding and desiccation, therefore, is expected to be minimal. The level of take associated with stranding and desiccation could increase in future years with LCR MSCP stocking of up to 620,000 subadults. The potential for take associated with stranding and desiccation would increase in Reach 4 for bonytail would develop after the species is stocked there, the overall of effect on the abundance of bonytail would be minimal because only a small proportion of bonytail present in the LCR MSCP planning area would be stocked in this reach.

Implementing future flow-related covered activities would reduce river depth during the spawning period. The lower depth could reduce potential spawning habitat area. Bonytail prefer backwaters and occupy pools and eddies away from strong currents (Pimentel and Bulkley 1983; Vanicek 1967). Backwaters are warmer and more productive than the main river channel, potentially supporting faster growth rates. In addition, backwaters with emergent vegetation provide cover and refuge from predators. Reduced flow, and the consequent shallower depth, could reduce rearing habitat area in the river and backwaters.

Based on known entrainment of razorback suckers in water diversions (Bureau of Reclamation 1996), diversions from the LCR may entrain bonytail. There are relatively few diversions directly from the river segment of Reach 3, although large diversions (i.e., Metropolitan and the CAWCD) are made from Lake Havasu. The diversions from the river channel are small relative to river flow, and potential individual entrainment

losses would be small; however, any entrainment of bonytail could affect the population because of its low population numbers. Entrainment of bonytail under implementation of flow-related covered activities will be similar to existing conditions (based on the area with measurable velocity toward the diversion intake).

Despite this, the number of bonytail that could be entrained in Reach 3 is expected to increase with implementation of the LCR MSCP, which will include augmenting the existing population by stocking up to 620,000 bonytail in the LCR. Bonytail, if introduced into Reaches 4 and 5, could be entrained in the canals and other diversions (e.g., Senator Wash Reservoir), resulting in a loss of individuals. Canals at Headgate Rock Dam, Palo Verde Diversion Dam, and Imperial Dam divert most of their flow from the river. Large diversions at Headgate Rock Dam and Palo Verde Diversion Dam could coincide with the planktonic larval life stage of bonytail in the summer, a period of potentially high entrainment vulnerability. In addition, reintroduced bonytail would be affected by the day-to-day operations and environmental conditions in the river, reservoirs, and backwaters. Eggs may be desiccated, and stranding losses could occur because daily flow variability would isolate and subsequently desiccate occupied habitat. LCR MSCP conservation measures to augment bonytail in Reach 3 and possibly stock bonytail in Reaches 4 and 5 is expected to result in take associated with entrainment.

5.5.4.2 Effects of Federal Non-Flow-Related Covered Activities

Non-flow-related covered activities to maintain the stable location and slope of the river channel include dredging, bank maintenance, and maintenance of levees, jetties, and training structures. These activities may result in take of bonytail in Reaches 3–5. Bonytail is currently present only in Reaches 2 and 3, but could be reintroduced in Reaches 4 and 5 in future years. Effects on bonytail would be temporary, generally encompassing the period of construction. Dredging may remove potential spawning and rearing habitat associated with wash fans. Dredging and maintenance activities would temporarily remove food organisms and cover from the dredged areas of river channel and backwaters. Placement of riprap and the removal of shoreline vegetation could reduce channel-edge complexity, thereby reducing cover from predator species and production of invertebrates that are food for fish (Hicks et al. 1991). Increased turbidity caused by dredging and maintenance activities could cause sedimentation of spawning and rearing habitat. Sedimentation could suffocate eggs and larvae and reduce the production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect survival, growth, and reproduction. These activities are expected to result in some low level of take over the term of the LCR MSCP. As described in Sections 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of the river channel and backwaters that provide habitat over the term of the LCR MSCP.

In addition to causing effects on habitat, dredging and maintenance of banks, levees, jetties, and training structures could cause direct mortality or cause fish to temporarily avoid using affected habitat. Direct mortality could result from entrainment into the dredge intake or physical trauma to the organisms. Adult and juvenile fish may move

away from affected habitat. These activities are expected to result in a low level of take over the term of the LCR MSCP.

Dredging backwaters and the areas surrounding jetties and training structures would maintain flow continuity between the backwaters and the river and maintain the backwater area and depth. Bonytail may benefit from maintenance of backwaters because backwaters along the LCR provide habitat (Bradford et al. 1998). Improved flow continuity in the backwaters would improve access and maintain water quality.

Construction and maintenance of fish grow-out coves, fishing docks, fish attraction structures, and boat ramps in Lake Mohave would disturb and cover up the reservoir bottom. The construction-related removal of potential spawning and rearing habitat would affect a small area and is not expected to adversely affect bonytail. Temporary adverse effects could be associated with the increased turbidity and contaminants that are contributed by construction and maintenance activities and that could affect spawning and rearing habitat. Sedimentation could suffocate eggs and larvae and reduce the production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect survival, growth, and reproduction. These activities are expected to result in a low level of take over the term of the LCR MSCP.

In addition to causing effects on habitat, construction and resulting recreational activities associated with fishing docks, artificial fish habitats, and boat ramps at Lake Mohave could cause direct mortality of fish or cause fish to temporarily avoid using affected habitat. Direct mortality could result from physical trauma to individual fish during construction or through capture by recreational anglers. Adult and juvenile fish may move away from affected habitat. In addition, these artificial habitats designed for nonnative fish species may adversely affect bonytail by increasing local predator density. These activities are expected to result in a low level of take over the term of the LCR MSCP.

Augmentation of the existing bonytail population through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of bonytail in the LCR MSCP planning area. Consequently, the number of bonytail exposed to disturbances caused by non-flow-related activities is expected to increase in future years.

5.5.4.3 Effects of LCR MSCP Implementation

Construction-related activities associated with establishing and managing LCR MSCP–created covered species habitat in Reaches 2 and 3 may result in take of bonytail. Adverse effects of habitat construction and maintenance activities on bonytail would be temporary, generally occurring during the period of construction. Habitat creation–related construction and maintenance activities may:

- cause juvenile and adult fish to temporarily avoid using affected habitat;

- increase turbidity and cause sedimentation of spawning and rearing habitat, which could suffocate eggs and larvae and temporarily reduce the production and availability of food organisms; and
- accidentally discharge contaminants or resuspend contaminants from disturbed sediments, which could adversely affect the survival, growth, and reproduction of bonytail.

Although construction and maintenance activities could adversely affect bonytail and its habitat, the extent of habitat disturbed would be small, the disturbance would be temporary, and the effects would be minimal. Control of competitor and predator species in created backwaters occupied by bonytail may also inadvertently capture, injure, or result in mortality of individual bonytail.

Stocking bonytail to augment the existing population could introduce and spread diseases and parasites. However, the use of modern fish culture practices that strive to minimize disease and parasite spread through enhancement of fish health, best management practices (BMPs), and other means would minimize the risk. In addition, transporting and handling bonytail during activities supporting augmentation may result in direct mortality of individual fish.

Buhl and Hamilton (1996) found that mixtures of inorganics derived from irrigation activities may have an adverse effect on larval and juvenile bonytail in the Green River. However, establishing and maintaining LCR MSCP–created habitats is not expected to increase contaminant concentrations above existing levels. Establishing and maintaining LCR MSCP habitats is not expected to require pesticide use that could diminish habitat value for terrestrial species, so creation of habitat on agricultural lands would likely result in an overall decrease in contaminant concentrations, or in no net change for nonagricultural sites. Runoff/return flow from habitat creation sites would be minimized to the greatest extent possible. Therefore, contaminants associated with runoff from LCR MSCP habitats are unlikely to adversely affect bonytail.

If bonytail are reintroduced into Reaches 4 and 5, the effects of LCR MSCP implementation on bonytail in these reaches would be the same as described above for Reaches 2 and 3.

Implementation of the LCR MSCP conservation measures, including creation of 360 acres of habitat and stocking of up to 620,000 subadult bonytail over the term of the LCR MSCP will fully mitigate effects of covered activities and help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained. Stocking subadult bonytail and the attendant monitoring and research conducted for the bonytail under the LCR MSCP Conservation Plan will contribute to attainment of the recovery goals established for the species (U.S. Fish and Wildlife Service 2002c).

5.5.4.4 Effects on Critical Habitat

In 1994, the USFWS proposed critical habitat for the bonytail. This BA does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat found at 50 C.F.R. §402.02. The definition of "destruction or adverse modification" found in

this BA relies upon the ESA and the analysis found in *Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service*, F.3d, (9th Circuit 2004).

Designated critical habitat for bonytail in the LCR MSCP planning area consists of:

- the Colorado River from Hoover Dam to Davis Dam, including Lake Mohave up to its full-pool elevation (i.e., Reach 2); and
- the Colorado River from the northern boundary of Havasu NWR to Parker Dam, including Lake Havasu up to its full-pool elevation (i.e., Reach 3).

Implementation of flow-related covered activities would not affect environmental conditions in Reach 2, including Lake Mohave. Therefore, critical habitat in Reach 2 would not be affected. Flow-related covered activities would affect environmental conditions in Reach 3, by changing river flow in the segment upstream of Lake Havasu and changing diversion in Lake Havasu, and would result in the loss of 77 acres of habitat. Implementation of non-flow-related activities and LCR MSCP conservation measures could also affect environmental conditions in Reaches 2 and 3, but is not expected to result in the loss of habitat.

Effects on critical habitat for the bonytail are confined to Reach 3 from the upper end of Lake Havasu to the upper end of Havasu NWR. Lake Havasu operations are not expected to change with the implementation of the covered activities. Implementation of covered activities would reduce river depth during the spawning period. The reduced depth could reduce potential spawning habitat area and associated backwaters. Bonytail prefer backwaters and occupy pools and eddies away from strong currents (Pimentel and Bulkley 1983; Vanicek 1967). Backwaters are warmer and more productive than the main river channel, potentially supporting faster growth rates. In addition, backwaters with emergent vegetation provide cover and potential refuges from predators. Reduced flow, and subsequent shallower depth, could reduce rearing habitat area in the river and backwaters. Reduced flow may also increase stranding losses where daily flow variability isolates and subsequently desiccates occupied habitat. Increasing stranding relative to the existing conditions depends on site-specific channel morphology and the relationship of reduced depth in association with ongoing daily flow fluctuation. Although the flow-related covered activities may have impacts on bonytail critical habitat, the factor limiting the abundance of bonytail and other LCR native fish species is competition from non-native fish species. Effects on bonytail critical habitat and predation are not expected to increase the threat from competition from non-native fish species. The possibility, therefore, of impacts on critical habitat resulting from the covered activities is not expected to appreciably diminish the value of critical habitat for species' conservation, affect the survival of the species, nor appreciably diminish the value of critical habitat for survival of the species. For the following reasons, there is not an appreciable diminishment of the *value* of critical habitat for bonytail conservation.

1. The LCR MSCP includes conservation measures specific to constructing or managing critical habitat for the bonytail within its designated critical habitat. The created habitat within designated critical habitat will be managed to provide higher value for the bonytail than the affected critical habitat it will replace (e.g., the habitat will be maintained free of nonnative competitors/predator fishes to the greatest extent practicable).

2. The implementation of the covered activities and the conservation measures will not diminish capacity of bonytail critical habitat present within the LCR MSCP planning area to a level that will preclude future achievement of the razorback sucker recovery goals (U.S. Fish and Wildlife Service 2002c).

In addition, the LCR MSCP provides for the continued adaptive management of conservation measures to ensure that implementation of the covered activities will not diminish the value of critical habitat for conservation.

Based on the understanding that the definition of adverse modification found at 50 C.F.R. §402.02 has been found to not comport with the ESA, this BA does not consider "survival" in the context of "survival and recovery". The survival of bonytail, however, will not be compromised by the possible effects on critical habitat resulting from Federal covered activities because: 1) the stocking of bonytail under the LCR MSCP will maintain and increase the abundance of bonytail; 2) the construction and management of backwaters within designated critical habitat to provide high value bonytail habitat will replace the value of affected habitat; and 3) the development of successful bonytail rearing methodology will ensure the availability of bonytail for re-introduction by ongoing and future programs.

5.5.5 Humpback Chub

Based on efforts to recover humpback chub in the Colorado River upstream of Lake Mead, humpback chub may occur in up to an estimated 62 miles of the Colorado River, in transitory river segments that could form within the full-pool elevation of Lake Mead when reservoir elevations are lowered to 950 feet msl. The potential effects of implementing flow-related covered activities and LCR MSCP conservation measures on the distribution and status of humpback chub are expected to be minor. These covered activities and conservation measures could affect a relatively small number of individuals that may periodically move into and use transitory river segments when they are present in Lake Mead. Critical habitat has been designated, but none is located in the LCR MSCP planning area; therefore, designated critical habitat will not be affected by covered activities and LCR MSCP implementation.

Federal non-flow-related covered activities and LCR MSCP implementation are not expected to result in take of humpback chub. For the reasons described below, implementation of the flow-related covered activities is likely to adversely affect humpback chub.

5.5.5.1 Effects of Flow-Related Covered Activities

Implementation of flow-related covered activities may result in take of humpback chub. flow-related covered activities that change reservoir elevations could cause up to 62 miles of transitory Colorado River channel to form if the reservoir pool is maintained at lower elevations. Such transitory river segments could be occupied by humpback chub. These segments would be lost when the reservoir pool elevation is raised. Over the term of the LCR MSCP, reservoir operations are expected to result in some low level of take.

5.5.6 Razorback Sucker

Implementation of the covered activities and LCR MSCP conservation measures could affect razorback sucker habitat in Lake Mead and a substantial proportion of habitat along the LCR (i.e., Reaches 3–5). The degree to which changes in points of diversion would affect the future distribution and status of razorback sucker in Reaches 3–5 compared to existing conditions is uncertain. The LCR MSCP Conservation Plan, however, includes conservation measures to replace affected razorback sucker habitat and stock razorback sucker over the term of the LCR MSCP in numbers sufficient to fully mitigate effects and contribute to the recovery of the species. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the razorback sucker. Implementation of the covered activities could impact razorback sucker critical habitat. These impacts, however, are not expected to appreciably diminish the value of critical habitat for species conservation.

5.5.6.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of razorback sucker. Flow-related covered activities that change flow in Reaches 3–5 would result in the loss of 399 acres of habitat, including designated critical habitat (see Table 5-5). The LCR MSCP would avoid the potential effects of lowering groundwater elevations on an additional 225 acres of created razorback habitat at Topock Marsh by maintaining water deliveries to Topock Marsh, thereby maintaining water levels and existing conditions.

The spawning habitat for razorback sucker in Lake Mead may be affected by changes in reservoir operations (see Appendix M). The known spawning elevations that may be important for razorback sucker are between 1,120 and 1,150 feet msl in Lake Mead. Current information shows that during the spawning seasons of 1997–2001, razorback sucker spawned at or near the cliff spawning site at the back of Echo Bay. This site was dry in 2002 and spawning occurred in a different area along the south shore of Echo Bay. During the 2003 spawning season, the 2002 spawning site was dry. However, razorback sucker apparently spawned along the same shore just east of the 2002 spawning site on a gravelly point submerged in 2–5 feet of water. In 2004 larval concentrations and habitat use of a telemetered fish indicated the Echo Bay population spawned approximately 250 meters east of the 2003 site (Welker and Holden 2004). These changes in spawning location indicates that razorback suckers would successfully move their spawning location to progressively lower elevations, where suitable spawning substrate is present, as the lake recedes. With the exception of sediment accumulation from Las Vegas Wash, recent investigations (Twichell and Rudin 1999) indicate that it is unlikely that sediment accumulation over available spawning substrate in the remainder of Lake Mead will affect spawning habitat area. The encroachment of sediment on spawning habitat from Las Vegas Wash, however, is not only a function of lowering lake levels, but is likely also related to high rainfall events and growing wastewater discharge as a result of growth in the Las Vegas area. Changes in Lake Mead reservoir operations are therefore expected to result in some low level of take over the term of the LCR MSCP.

Razorback suckers require clean gravel in shallow areas of quiet water for spawning from January through April/May (Langhorst and Marsh 1986). Implementing future flow-related covered activities would reduce river depth during the spawning period. The reduced depth could reduce potential spawning habitat area. Connected backwaters and low-velocity channel types, such as pool edges and side channels, provide rearing habitat for larval and juvenile razorback sucker. Stocked razorback show a preference for backwaters over the main channel habitats (Gurtin and Bradford 2000). Backwaters are warmer and more productive than the main river channel, potentially supporting faster growth rates. In addition, backwaters with emergent vegetation provide cover and refuge from predators. Reduced flow, and the resulting shallower depth, could reduce rearing habitat area in the river and backwaters.

Ongoing operations of reservoirs for hydropower generation result in river flow fluctuations that can vary substantially over a 24-hour period and could result in stranding or desiccation of razorback sucker. The potential for stranding or desiccation of razorback sucker to occur is governed by two primary factors. The first factor is the site specific channel morphology, including the presence of gravel and cobble bars, side channels, or shallow backwaters within the river reach affected by the fluctuating flows. The closer to the dam these physical channel features are located, the amount of water level fluctuation will be greater, since fluctuations attenuate downstream (see Appendix J) and water levels stabilize. The second factor is the current distribution and abundance of razorback sucker in the LCR MSCP planning area. The number of individual razorback sucker in the areas of greatest fluctuations is low, and most of the razorback sucker in the LCR do not inhabit areas subject to significant fluctuations. Implementation of future flow-related covered activities would reduce river flow. Consequently, although river operations related to hydropower generation will not change (see Section 5.2.1.3), the range of high and low flows will be lower than under existing conditions. Changes to the water elevations below Davis Dam (Reach 3) and Parker Dam (Reach 4) are depicted in Table 5-2. These changes differ seasonally and range between –2.09 and –0.01 feet at Davis Dam and –2.46 and –0.21 feet at parker Dam. The pattern of fluctuations does not change, and once reduced flows are expressed, no additional changes to elevations would be expected. The end result of these changes is not substantial related to existing conditions. The change in the potential for stranding and desiccation, therefore, is expected to be minimal. The level of take associated with stranding and desiccation could increase in future years with LCR MSCP stocking of up to 660,000 subadults.

Diversions from the LCR may entrain razorback sucker. Razorback suckers have been observed in the CRIT canal system (Bureau of Reclamation 1996). Razorback suckers have been entrained in and captured with the CAP canal (Bureau of Reclamation 1996). Razorback suckers have also been observed in Senator Wash Reservoir, which may indicate that they were entrained with water diverted from the LCR. Alternatively, razorback suckers observed in the reservoir may have been surviving fish from those stocked in the reservoir by CDFG between 1987 and 1990. There are relatively few diversions directly from the river in Reach 3, although large diversions are made from Lake Havasu. Entrainment of razorback sucker with changes in points of diversion would be similar to existing conditions.

In Reach 4, canals at Headgate Rock Dam and Palo Verde Diversion Dam divert a substantial proportion of flow from the river. The increased proportion of river flow

diverted could increase entrainment losses of razorback sucker. The level of entrainment of razorback suckers in Reach 5 is not expected to increase because nearly all of the river flow in this reach is diverted into canals and power generation facilities at Imperial Dam, and diversions to Senator Wash Reservoir will not change.

The number of razorback suckers that could be entrained is expected to increase with implementation of the LCR MSCP Conservation Plan, which will include augmenting the existing population by stocking up to 660,000 razorback suckers in the LCR. Implementation of LCR MSCP conservation measures to augment the existing population is expected to result in a low level of take associated with entrainment.

5.5.6.2 Effects of Federal Non-Flow-Related Covered Activities

Non-flow-related covered activities to maintain the stable location and slope of the river channel include dredging, bank maintenance, and maintenance of levees, jetties, and training structures. These activities could result in take of razorback sucker in Reaches 3–5. Effects on razorback sucker would be temporary, generally encompassing the period of construction. Dredging may remove potential spawning and rearing habitat associated with wash fans. Dredging and maintenance activities would temporarily remove food organisms and cover from the dredged areas of the river channel and backwaters. Placement of riprap and the removal of shoreline vegetation could reduce channel-edge complexity, reducing cover from predator species and production of invertebrates that are food for fish (Hicks et al. 1991). Increased turbidity caused by dredging and maintenance activities could result in sedimentation of spawning and rearing habitat. Sedimentation could suffocate eggs and larvae and reduce the production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect survival, growth, and reproduction. These activities are expected to result in some low level of take over the term of the LCR MSCP. As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of the river channel and backwaters that provide habitat as a result of the potential for further degradation from baseline conditions of the geomorphic processes that contribute to the maintenance and regeneration of habitat over the term of the LCR MSCP.

In addition to causing effects on habitat, dredging and maintenance of banks, levees, jetties, and training structures could cause direct mortality or cause fish to temporarily avoid using affected habitat. Direct mortality could result from entrainment into the dredge intake or physical trauma to the organisms. Adult and juvenile fish may move away from affected habitat. These activities are expected to result a low level of take over the term of the LCR MSCP.

Dredging the areas surrounding jetties and training structures, as well as dredging backwaters, would maintain flow continuity between the backwaters and the river and maintain the backwater area and depth. Razorback sucker may benefit from maintenance of backwaters because backwaters along the LCR provide habitat (Bradford et al. 1998). Improved flow continuity in the backwaters would improve access and maintain water quality.

Construction and maintenance of fish grow-out coves, fishing docks, fish attraction structures, and boat ramps in Lake Mead and Lake Mohave would disturb and cover up the reservoir bottom. The removal of potential spawning and rearing habitat associated with construction would affect a small area and is not expected to adversely affect razorback sucker. Increased turbidity and contaminants contributed by construction and maintenance activities could cause temporary adverse effects by affecting spawning and rearing habitat. Sedimentation could suffocate eggs and larvae and reduce the production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect survival, growth, and reproduction. These activities are expected to result in a low level of take over the term of the LCR MSCP.

In addition to effects on habitat, construction and resulting recreational activities associated with fishing docks, aritificial fish habitats, and boat ramps at Lake Mead and Lake Mohave could cause direct mortality or cause fish to temporarily avoid using affected habitat. Direct mortality could result from physical trauma to individual fish during construction or through capture by recreational anglers. Adult and juvenile fish may move away from affected habitat. In addition, these artificial habitats designed for nonnative fish species may adversely affect razorback sucker by increasing local predator density. These activities are expected to result in a low level of take over the term of the LCR MSCP.

Augmentation of the existing razorback sucker population through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of razorback sucker in the LCR MSCP planning area. Consequently, the number of razorback suckers exposed to disturbances caused by non-flow-related activities is expected to increase in future years.

5.5.6.3 Effects of LCR MSCP Implementation

Construction-related activities associated with establishing and managing LCR MSCP–created covered species habitat in Reaches 1–5 may result in take of razorback sucker. Adverse effects of habitat construction and maintenance activities on razorback sucker would be temporary, generally occurring during the period of construction. Habitat creation–related construction and maintenance activities may:

- cause juvenile and adult fish to temporarily avoid using affected habitat;
- disturb substrate and cause sedimentation of spawning and rearing habitat, which could suffocate eggs and larvae and temporarily reduce the local production and availability of food organisms; and
- accidentally discharge contaminants or resuspend contaminants from disturbed sediments, which could adversely affect the survival, growth, and reproduction of razorback sucker.

Although construction and maintenance activities could adversely affect the razorback sucker and its habitat, the extent of habitat disturbed would be small, the disturbance would be temporary, and the effects would be minimal. Control of competitor and

predator species in created backwaters occupied by razorback suckers may also inadvertently capture, injure, or result in mortality of individual razorback sucker.

Stocking razorback suckers to augment the existing population could introduce and spread diseases and parasites and could adversely affect the genetic and ecological distinctiveness of the existing razorback sucker population. However, the use of modern fish culture practices that strive to minimize disease and parasite spread by enhancing fish health, implementing best management practices, and using other means would minimize the risk. Genetic monitoring and management would also be incorporated.

The transport and handling of razorback sucker during activities supporting augmentation may result in direct mortality of individual fish. Stocking bonytail to augment the existing bonytail population could also adversely affect the razorback sucker population through competition and predation.

Buhl and Hamilton (1996) found that mixtures of inorganics derived from irrigation activities may have an adverse effect on larval and juvenile razorback suckers in the Green River. However, establishing and maintaining LCR MSCP–created habitats is not expected to increase contaminant concentrations above existing levels. Establishing and maintaining LCR MSCP habitats is not expected to require pesticide use that could diminish habitat value for terrestrial species, so creation of habitat on agricultural lands would likely result in an overall decrease in contaminant concentrations, or in no net change for nonagricultural sites. Runoff/return flow from habitat creation sites would be minimized to the greatest extent possible. Therefore, contaminants associated with runoff from LCR MSCP habitats are unlikely to adversely affect razorback sucker.

Implementation of the LCR MSCP conservation measures, including creation of 360 acres of habitat and stocking of up to 660,000 subadult razorback sucker will fully mitigate effects of covered activities and help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained. Stocking subadult razorback sucker and the attendant monitoring and research conducted for the razorback sucker under the LCR MSCP Conservation Plan will contribute to attainment of the recovery goals established for the species (U.S. Fish and Wildlife Service 2002e).

5.5.6.4 Effects on Critical Habitat

In 1994, the USFWS proposed critical habitat for the razorback sucker. This BA does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat found at 50 C.F.R. §402.02. The definition of "destruction or adverse modification" found in this BA relies upon the ESA and the analysis found in *Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service* (9th Circuit 2004).

Designated critical habitat for razorback sucker in the LCR MSCP planning area consists of:

- Lake Mead up to its full-pool elevation (i.e., Reach 1);
- the Colorado River and its 100-year floodplain from Hoover Dam to Davis Dam, including Lake Mohave up to its full-pool elevation (i.e., Reach 2); and

- the Colorado River and its 100-year floodplain from Parker Dam to Imperial Dam, including Imperial Reservoir to the full-pool elevation or 100-year floodplain, whichever is greater (i.e., Reaches 4 and 5).

Implementation of flow-related covered activities would affect environmental conditions in Reach 1. Reductions in Lake Mead lake levels with the implementation of flow-related covered activities may result in impacts on critical habitat. Implementation of flow-related covered activities would not affect environmental conditions in Reach 2, including Lake Mohave. Therefore, critical habitat in Reach 2 would not be affected. Flow-related covered activities would affect environmental conditions in Reaches 4 and 5, by changing river flow and the proportion of flow diverted, and would result in the loss of 214 acres of habitat. Implementation of non-flow-related activities and LCR MSCP conservation measures could affect environmental conditions in Reaches 1, 2, 4, and 5, but are not expected to result in the loss of habitat.

The spawning habitat for razorback sucker in Lake Mead may be affected with changes in reservoir operations (see Appendix M). The known spawning elevations that may be important for the razorback sucker occur between 1,120 and 1,150 feet msl in Lake Mead. Current information shows at Echo Bay, during the spawning seasons of 1997–2001, razorback sucker spawned at or near the cliff spawning site at the back of the bay. This site was dry in 2002 and spawning occurred in a different area along the south shore of Echo Bay. During the 2003 spawning season, the 2002 spawning site was dry: however, razorback sucker apparently spawned along the same shore just east of the 2002 spawning site on a gravelly point submerged in 2–5 feet of water (BIO-WEST 2003). These changes in spawning location indicate the razorback sucker will successfully move their spawning location into progressively lower elevations where suitable spawning substrate is present as the lake recedes. Findings of recent investigations have determined that it is unlikely that sediment accumulation over available spawning substrate will affect spawning habitat area (see Appendix M).

Adverse effects on razorback sucker critical habitat that may occur in the riverine reaches of the LCR would result from stranding and desiccation from daily water delivery operations and the gradual lowering of water surface elevations in the main channel and backwaters. Implementation of future flow related covered activities would reduce river depth during the spawning period. The reduced depth could reduce potential spawning habitat area. Connected backwaters and low-velocity channel types, such as pool edges and side channels, provide rearing habitat for larval and juvenile razorback sucker. Stocked razorback suckers show a preference for backwaters over the main channel habitats (Gurtin and Bradford 2000). Backwaters are warmer and more productive than the main river channel, potentially supporting faster growth rates. In addition, backwaters with emergent vegetation provide cover and potential refuges from predators. Reduced flow, and subsequent shallower depth, could reduce rearing habitat are in the river and backwaters. Reduced flow may also increase the incidence of stranding where daily flow variability isolates and subsequently desiccates habitat. Increased stranding relative to the existing conditions depends on site-specific channel morphology and the relationship with reduced depth in association with ongoing daily flow fluctuation.

The factor limiting the abundance of razorback sucker and other LCR native fish species is competition and predation from non-native fish species. If impacts on razorback sucker critical habitat results from implementation of Federal covered activities, it is not

expected to increase the threat from competition from non-native fish species. The possibility, therefore, of impacts on critical habitat resulting from the covered activities is not expected to appreciably diminish the value of critical habitat for species' conservation, affect the survival of the species, nor appreciably diminish the value of critical habitat for survival of the species. For the following reasons, there is not an appreciable diminishment of the *value* of critical habitat for razorback sucker conservation:

1. The LCR MSCP includes conservation measures specific to constructing or managing critical habitat for the razorback sucker within its designated critical habitat. The created habitat within designated critical habitat will be managed to provide higher value for the razorback sucker than the affected critical habitat it will replace (e.g., the habitat will be maintained free of nonnative competitors/predator fishes to the greatest extent practicable).
2. The implementation of the covered activities and the conservation measures will not diminish capacity of razorback sucker critical habitat present within the LCR MSCP planning area to a level that will preclude future achievement of the razorback sucker recovery goals (U.S. Fish and Wildlife Service 2002e).

In addition, the LCR MSCP provides for the continued adaptive management of conservation measures to ensure that implementation of the covered activities will not diminish the value of critical habitat for conservation.

Based on the understanding that the definition of adverse modification found at 50 C.F.R. §402.02 has been found to not comport with the ESA, this BA does not consider "survival" in the context of "survival and recovery". The survival of razorback sucker, however, will not be compromised by the possible effects on critical habitat resulting from Federal covered activities, because: 1) ongoing programs conducted by the Lake Mohave Native Fish Work Group which are incorporated within the LCR MSCP will ensure a strong diverse genetic source to ensure survival of razorback sucker into the future; 2) the stocking of razorback sucker under the LCR MSCP will maintain and increase the abundance of razorback sucker; 3) the construction and management of backwaters within designated critical habitat to provide high value razorback sucker habitat will replace the value of affected habitat; and 4) the development of successful razorback sucker rearing methodology will ensure the availability of razorback suckers for re-introduction by ongoing and future programs.

5.5.7 Western Red Bat

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the western red bat are expected to be minor, affecting a relatively small number of individuals and proportion of its roosting habitat throughout its range over the term of the LCR MSCP. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the western red bat, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat. For the reasons described below, implementation of the flow-related

and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the western red bat.

5.5.7.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of western red bat in Reaches 3–5. Changes in points of diversion in Reaches 3–5 will reduce groundwater sufficiently in these reaches to reduce the extent or quality of 161 acres of cottonwood-willow land cover types I and II that provide western red bat habitat (see Table 5-5). Lowering of groundwater elevations could reduce the production and abundance of insect prey by changing the extent, frequency, and duration that surface water or moist soil surface conditions are present in patches of riparian land cover. There is currently insufficient information to determine whether reduction in groundwater levels would reduce the abundance of insect prey species enough to affect western red bat. For purposes of this assessment, it is assumed that there would be a low level of take associated with effects on prey species over the term of the LCR MSCP.

As described in Section 5.2.3.3, cottonwoods and willows that could provide roosting habitat for the western red bat may establish as Lake Mead reservoir elevations decline over the term of the LCR MSCP at the Lake Mead delta, Virgin River delta, Muddy River delta, and the portion of the Grand Canyon influenced by Lake Mead. Cottonwoods and willow that provide roosting habitat would not likely establish except when the timing of when suitable substrates are wetted by changes in reservoir elevations coincides with the timing of cottonwood and willow seed dispersal. Western red bat roosting habitat is not currently present within the full pool elevation of Lake Mead and implementation of the covered activities will not result in immediate take of western red bat. Cottonwoods and willows could establish under favorable reservoir conditions in the future and could be lost when reservoir elevations subsequently decline or rise sufficiently to respectively desiccate or inundate the habitat. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations over the term of the LCR MSCP cannot be predicted based on the available information. The periodic loss of this ephemeral roosting habitat, however, could result in a low level of take of western red bat over the term of the LCR MSCP.

As described in Section 5.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

5.5.7.2 Effects of Federal Non-Flow-Related Covered Activities

Conversion of lands to agricultural uses and operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration and maintenance projects; conversion of lands to agriculture) could result in take of western red bat. Converting lands to agricultural uses could result

in the loss of 604 acres of roosting habitat (see Table 5-5). Disturbances associated with implementing other non-flow-related covered activities (e.g., operation of equipment) could result in the direct removal of trees that provide roosting habitat and in harassment of individuals if these activities are undertaken near roosts. These activities could result in a low level of take over the term of the LCR MSCP. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

5.5.7.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining covered species habitat may result in take of western red bat. To the extent practicable, habitat creation–related activities would avoid removing cottonwoods, willows, and honey mesquite that could serve as roosts. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take that could be associated with removal of these land cover types.

The maximum extent of habitat that could be affected by habitat management activities is estimated to be 7,260 acres (i.e., the extent of cottonwood-willow and honey mesquite land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. Disturbances associated with creating covered species habitat (e.g., operation of equipment) and ongoing maintenance of created habitats and conservation area infrastructure could result in harassment of individuals if these activities are undertaken near roosts.

Implementation of the LCR MSCP Conservation Plan will create at least 765 acres of western red bat roosting habitat to replace habitat that could be lost as a result of covered activities.

5.5.8 Western Yellow Bat

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the western yellow bat are expected to be minor, affecting a relatively small number of individuals and proportion of its

roosting habitat throughout its range over the term of the LCR MSCP. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the western yellow bat, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the western yellow bat.

5.5.8.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of western yellow bat in Reaches 3–5. Changes in points of diversion in Reaches 3–5 would reduce groundwater sufficiently in these reaches to reduce the extent or quality of 161 acres of cottonwood-willow land cover types I and II that provide western yellow bat habitat (see Table 5-5). Lowering of groundwater elevations could affect the production of insect prey by changing the extent, frequency, and duration that surface water or moist soil surface conditions are present in patches of riparian land cover. There is currently insufficient information to determine whether reduction in groundwater levels would reduce the abundance of insect prey species enough to affect western yellow bat. For purposes of this assessment, it is assumed that there would be a low level of take associated with effects on prey species over the term of the LCR MSCP.

As described in Section 5.2.3.3, cottonwoods and willows that could provide roosting habitat for the western yellow bat may establish as Lake Mead reservoir elevations decline over the term of the LCR MSCP at the Lake Mead delta, Virgin River delta, Muddy River delta, and the portion of the Grand Canyon influenced by Lake Mead. Cottonwoods and willow that provide roosting habitat would not likely establish except when the timing of when suitable substrates are wetted by changes in reservoir elevations coincides with the timing of cottonwood and willow seed dispersal. Western yellow bat roosting habitat is not currently present within the full pool elevation of Lake Mead and implementation of the covered activities will not result in immediate take of western yellow bat. Cottonwoods and willows could establish under favorable reservoir conditions in the future and could be lost when reservoir elevations subsequently decline or rise sufficiently to respectively desiccate or inundate the habitat. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations over the term of the LCR MSCP cannot be predicted based on the available information. The periodic loss of this ephemeral roosting habitat, however, could result in a low level of take of western yellow bat over the term of the LCR MSCP.

As described in Section 5.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

5.5.8.2 Effects of Federal Non-Flow-Related Covered Activities

Conversion of lands to agricultural uses and operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration and maintenance projects; conversion of lands to agriculture) could result in take of western yellow bat. Converting lands to agricultural uses could result in the loss of 604 acres of roosting habitat (see Table 5-5). Disturbances associated with implementing other non-flow-related covered activities (e.g., operation of equipment) could result in the direct removal of trees that provide roosting habitat and in harassment of individuals if these activities are undertaken near roosts. These activities could result in a low level of take over the term of the LCR MSCP. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

5.5.8.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining covered species habitat may result in take of western yellow bat. To the extent practicable, habitat creation–related activities would avoid removing cottonwoods, willows, and honey mesquite that could serve as roosts. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take that could be associated with removal of these land cover types.

The maximum extent of habitat that could be affected by habitat management activities is estimated to be 7,260 acres (i.e., the extent of cottonwood-willow and honey mesquite land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. Disturbances associated with creating covered species habitat (e.g., operation of equipment) and ongoing maintenance of created habitats and conservation area infrastructure could result in harassment of individuals if these activities are undertaken near roosts.

Implementation of the LCR MSCP Conservation Plan will create at least 765 acres of western yellow bat roosting habitat to replace habitat that could be lost as a result of covered activities.

5.5.9 Desert Pocket Mouse

Desert pocket mouse inhabits fluvial soil in the transitional zone between desert riparian and desert scrub communities in Reaches 1 and 2, and in Reach 3 south to Topock Gorge (Jameson and Peeters 1988; Genoways and Brown 1993). Flow-related covered activities would not affect land cover types that provide desert pocket mouse habitat and, therefore, would not result in take of desert pocket mouse.

The potential effects of implementing non-flow-related covered activities and LCR MSCP conservation measures on the distribution and status of the desert pocket mouse are expected to be minor, potentially affecting a relatively small number of individuals and proportion of its habitat over the term of the LCR MSCP. The desert pocket mouse would be affected only if LCR MSCP habitat creation and maintenance activities are implemented in its habitat. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize effects on habitat and provides for the restoration of any habitat that may be disturbed as a result of these activities. For the reasons described below, implementation of the non-flow-related covered activities and the LCR MSCP is likely to adversely affect the desert pocket mouse.

5.5.9.1 Effects of Federal Non-Flow-Related Covered Activities

Proposed restoration of up to 600 acres of native riparian vegetation in Reaches 1 and 2 in the Lake Mead NRA (see Chapter 2, "Description of Federal Actions (Covered Activities)") may result in take of desert pocket mouse if implemented in the species' habitat. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary or permanent loss of habitat and harassment, injury, or mortality of individuals. Effects on habitat would be temporary for restoration projects that restore or improve existing desert pocket mouse habitat (e.g., mixed mesquite and desert scrub vegetation). To the extent practicable, these activities would be designed to avoid desert pocket mouse habitat. These activities, however, could inadvertently result in some low level of take over the term of the LCR MSCP. Implementation of ongoing flow-related covered activities are not expected to result in indirect effects on the desert pocket mouse.

5.5.9.2 Effects of LCR MSCP Implementation

Activities associated with establishing and managing LCR MSCP–created covered species habitat in desert pocket mouse habitat in Reaches 1–3 may result in take of desert pocket mouse. Habitat creation- and management-related activities, such as operation of equipment to remove vegetation and maintain roads, could result in temporary or

permanent loss of habitat and harassment, injury, or mortality of individuals. To the extent practicable, desert pocket mouse habitat would not be removed to create habitat for other species. These activities, however, could inadvertently result in some low level of take over the term of the LCR MSCP. The level of adverse effects on habitats and individuals will depend on the extent of LCR MSCP–created habitat that is established in desert pocket mouse habitat.

Created habitats will be designed, to the extent consistent with achieving LCR MSCP conservation objectives for other species, to avoid affecting desert pocket mouse habitat. If habitat cannot be avoided, the LCR MSCP Conservation Plan provides for fully mitigating effects on the species.

5.5.10 Colorado River Cotton Rat

Although the Colorado River cotton rat is only known from along the LCR (Reaches 3 and 4), the potential effects of implementing covered activities and LCR MSCP conservation measures on distribution and status of the Colorado River cotton rat are expected to be minor, potentially affecting less than 2 percent of marsh land cover that provides habitat. The LCR MSCP Conservation Plan includes conservation measures to minimize and mitigate the potential effects of habitat loss with the creation of replacement habitat. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the Colorado River cotton rat.

5.5.10.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of Colorado River cotton rat. Changes in points of diversion in Reaches 3 and 4 will lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 59 acres of habitat (see Table 5-5) provided by marshes associated with backwaters. Reservoir elevations in Reaches 3–4 would not be affected by lower river stage elevations. Consequently, flow-related activities are not expected to affect habitat associated with marshes maintained by reservoirs (e.g., Bill Williams Delta [Reach 3]) or that are managed to support marsh vegetation (e.g., Cibola NWR [Reach 4]). The LCR MSCP will avoid the potential effects of lowering groundwater elevations on an additional 16 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh, thereby maintaining water levels and existing habitat conditions (see Table 5-3). Lowering groundwater elevations could cause direct loss of habitat by desiccating, fragmenting, or reducing the extent of habitat patches.

As described in Section 5.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of marshes that provide habitat over the term of the LCR MSCP.

5.5.10.2 Effects of Federal Non-Flow-Related Covered Activities

Periodic maintenance of boat ramps, gaging stations, and water control structures will remove emergent vegetation and affect up to 3 acres of Colorado River cotton rat habitat (see Table 5-5). Operation of equipment and other activities associated with removing habitat could also result in harassment, injury, or mortality of individuals. As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of marshes that provide habitat over the term of the LCR MSCP.

These activities are expected to result in some low level of take over the term of the LCR MSCP.

5.5.10.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining backwaters and marsh as habitat for covered species may result in take of Colorado River cotton rat. LCR MSCP habitat creation–related activities could result in temporary disturbance of habitat and harassment of individuals if they are present at the time activities are implemented, but these activities would avoid removing primary habitat to establish habitat for other covered species. Up to 125 acres of existing degraded or former marsh that may provide low-value habitat could be type-converted to fully functioning marsh that provides high-value Colorado River cotton rat habitat. Some additional limited and low-value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) could be converted to habitat to benefit other covered species.

Habitat management–related activities, such as operating equipment to remove vegetation and maintain open water in backwaters and burning decadent marsh vegetation to stimulate vegetation growth, could result in temporary loss of habitat and harassment, injury, or mortality of individuals. The LCR MSCP would avoid removing habitat to create habitat for other covered species. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 512 acres (i.e., the extent of marsh land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

Implementation of the LCR MSCP Conservation Plan will create at least 125 acres of Colorado River cotton rat habitat to replace habitat that could be lost as a result of covered activities.

5.5.11 Yuma Hispid Cotton Rat

Yuma hispid cotton rat is present in Reaches 6 and 7, which would not be affected by flow-related covered activities. Flow-related covered activities, therefore, would not result in take of Yuma hispid cotton rat.

The potential effects of implementing non-flow-related covered activities and LCR MSCP conservation measures on the distribution and status of the Yuma hispid cotton rat are expected to be minor, affecting a relatively small number of individuals and proportion of its habitat over the term of the LCR MSCP. The LCR MSCP Conservation Plan includes conservation measures to minimize and mitigate the potential effects of habitat loss with the creation of replacement habitat. For the reasons described below, implementation of the non-flow-related covered activities and the LCR MSCP is likely to adversely affect the Yuma hispid cotton rat.

5.5.11.1 Effects of Federal Non-Flow-Related Covered Activities

Dredging desilting basins and converting lands to agriculture in Reaches 6 and 7 would remove up to 71 acres of Yuma hispid cotton rat habitat (see Table 5-5). Operation of equipment and other activities associated with removal of habitat could also result in harassment, injury, or mortality of individuals. As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

These activities are expected to result in some low level of take over the term of the LCR MSCP.

5.5.11.2 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining habitat for covered species may result in take of Yuma hispid cotton rat. LCR MSCP habitat creation–related activities could result in temporary disturbance of habitat and harassment of individuals if they are present at the time activities are implemented, but these activities would avoid removing primary habitat to establish habitat for other covered species. Some limited and low-value habitat (e.g., patches of saltcedar and saltcedar-dominated land cover types) could be converted to habitat to benefit other covered species; with implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, removal of these low-quality habitats is not expected to result in harm (i.e., injury or mortality of individuals); therefore, it is not expected to result in take of Yuma hispid cotton rat. Habitat management–related activities, such as operation of equipment to remove vegetation to set back succession, could result in temporary loss of habitat and harassment, injury, or mortality of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be no more than 1,000 acres (i.e., the extent of cottonwood-willow land cover likely to be created as habitat for

associated covered species in Reaches 6 and 7) over the term of the LCR MSCP. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

Implementation of the LCR MSCP Conservation Plan will create at least 76 acres of Yuma hispid cotton rat habitat to replace habitat that could be lost as a result of covered activities.

5.5.12 Western Least Bittern

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the western least bittern are expected to be minor, affecting a relatively small number of individuals and proportion of its habitat throughout its range over the term of the LCR MSCP. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the western least bittern, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the western least bittern.

5.5.12.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of western least bittern. Changes in points of diversion in Reaches 3–5 would lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 133 acres of habitat (see Table 5-5) provided by marshes associated with backwaters. Reservoir elevations in Reaches 3–5 would not be affected by lower river stage elevations. Consequently, flow-related activities are not expected to affect habitat associated with marshes maintained by reservoirs (e.g., Bill Williams Delta [Reach 3]) or that are managed to support marsh vegetation (e.g., Imperial NWR [Reach 5]). The LCR MSCP would avoid the potential effects of lowering groundwater elevations on an additional 16 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh, thereby maintaining water levels and existing habitat conditions (see Table 5-3). Lowering groundwater elevations could cause direct loss of these habitats by desiccating, fragmenting, or reducing the extent of habitat patches.

As described in Section 5.2.3.3, implementation of flow-related covered activities may affect marsh vegetation that provides western least bittern habitat that periodically establish at inflow points of Lake Mead (e.g., Colorado River delta, Virgin River delta, Muddy River delta) when Lake Mead water surface elevations are below full pool. Marsh habitat below the full pool elevation will be created and lost based on water surface elevations. For example, marsh vegetation established at a certain elevation may be lost if the water surface elevation declines so that groundwater elevations drop below the rooting depths of emergent vegetation. Alternatively, established marsh vegetation would be inundated and lost during wetter periods, when Lake Mead reservoir elevations rise. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations

over the term of the LCR MSCP cannot be predicted based on the available information. The periodic loss of these ephemeral marshes, however, could result in a low level of take of western least bittern over the term of the LCR MSCP.

As described in Section 5.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of marshes that provide habitat over the term of the LCR MSCP.

5.5.12.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration and maintenance projects; conversion of lands to agriculture) may result in take of western least bittern. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting western least bitterns. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 70 acres of western least bittern habitat could be removed to maintain channel functions (e.g., dredging desilting basins) (see Table 5-5). Activities associated with removal of habitat during the breeding season could result in mortality of eggs or nestlings. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of marshes that provide habitat over the term of the LCR MSCP.

The creation of western least bittern habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of western least bittern in the LCR MSCP planning area. Consequently, the number of western least bitterns exposed to disturbances by these types of non-flow-related activities is expected to increase in future years.

5.5.12.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining backwaters and marsh as habitat for covered species may result in take of western least bittern. LCR MSCP habitat creation–related activities could result in temporary disturbance of habitat and harassment of individuals if they are present at the time activities are implemented, but these activities would avoid removing primary habitat to establish habitat for other covered species. Up to 512 acres of existing degraded or former marsh that may provide low-value habitat could be converted to fully functioning marsh that provides high-value western least bittern habitat. Some additional limited and low-value habitat (e.g., dry patches of

herbaceous vegetation near marsh edges) could be converted to habitat to benefit other covered species. However, with implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, removal of these low-quality habitats is not expected to result in harm (i.e., injury or mortality of individuals); therefore, it is not expected to result in take of western least bittern.

Habitat management–related activities, such as operating equipment to remove vegetation and maintain open water in backwaters and burning decadent marsh vegetation to stimulate vegetation growth, could result in temporary loss of habitat and harassment, injury, or mortality of individuals. To the extent practicable, these activities would be conducted when nesting adults and young birds are not present, to avoid injury or mortality. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 512 acres (i.e., the extent of marsh land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood of take is expected to increase over the term of the LCR MSCP if the abundance of western least bittern increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

Implementation of the LCR MSCP Conservation Plan will create 512 acres of western least bittern habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of new habitat by 269 acres.

5.5.13 California Black Rail

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the California black rail are expected to be minor, affecting a relatively small number of individuals and proportion of its habitat throughout its range over the term of the LCR MSCP. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the California black rail, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the California black rail.

5.5.13.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of California black rail. Reservoir elevations in Reaches 3–6 would not be affected by lower river stage elevations. Consequently, flow-related activities are not expected to affect habitat associated with marshes maintained by reservoirs (e.g., Bill Williams Delta [Reach 3]) or that are managed to support marsh vegetation (e.g., Imperial NWR [Reach 5]). In Reaches 3 and 4, with the exception of Topock Marsh, California black rails are associated with marshes that would not be affected by flow-related covered activities. The LCR MSCP would avoid the potential effects of lowering groundwater elevations on an additional 16 acres of habitat at Topock

Marsh by maintaining water deliveries to Topock Marsh, thereby maintaining water levels and existing habitat conditions (see Table 5-3). However, lowering groundwater elevations could result in the loss of 37 acres of California black rail habitat in Reach 5 by desiccating, fragmenting, or reducing the extent of habitat (see Table 5-5) provided by marshes associated with backwaters.

As described in Section 5.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of marshes that provide habitat over the term of the LCR MSCP.

5.5.13.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration and maintenance projects; conversion of lands to agriculture) could result in take of California black rail. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting California black rails. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 31 acres of California black rail habitat could be removed to maintain channel functions (e.g., dredging desilting basins) (see Table 5-5). Activities associated with removal of habitat during the breeding season could result in mortality of eggs or young. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of marshes that provide habitat over the term of the LCR MSCP.

The creation of California black rail habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of California black rail in the LCR MSCP planning area. Consequently, the number of California black rails exposed to disturbances by these types of non-flow-related activities is expected to increase in future years.

5.5.13.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining backwaters and marsh as habitat for covered species may result in take of California black rail. LCR MSCP habitat creation–related activities could result in temporary disturbance of habitat and harassment of individuals if they are present at the time activities are implemented, but these activities would avoid removing primary habitat to establish habitat for other covered species. Up to 130 acres of existing degraded or former marsh that may provide low-value habitat

could be converted to fully functioning marsh that provides high-value California black rail habitat. Some additional limited and low-value habitat (e.g., dry patches of herbaceous vegetation near marsh edges) could be converted to habitat to benefit other covered species. However, with implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, removal of these low-quality habitats is not expected to result in harm (i.e., injury or mortality of individuals); therefore, it is not expected to result in take of California black rail.

Habitat management–related activities, such as operating equipment to remove vegetation and maintain open water in backwaters and burning decadent marsh vegetation to stimulate vegetation growth, could result in temporary loss of habitat and harassment of individuals. To the extent practicable, these activities would be conducted when nesting adults and young birds are not present, to avoid injury and mortality. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 512 acres (i.e., the extent of marsh land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood of take is expected to increase over the term of the LCR MSCP if the abundance of California black rail increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

Implementation of the LCR MSCP Conservation Plan will create at least 130 acres of California black rail habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of new habitat by 27 acres. In addition, the LCR MSCP Conservation Plan will maintain existing important California black rail habitat areas in the LCR MSCP planning area.

5.5.14 Yellow-Billed Cuckoo

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the yellow-billed cuckoo are expected to be minor, affecting a relatively small number of individuals and proportion of its habitat throughout its range over the term of the LCR MSCP. Within the LCR MSCP planning area, the effects of changes in points of diversion on cottonwood-willow land cover that provides habitat will be gradual and commensurate with the creation of higher value replacement habitats. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the yellow-billed cuckoo, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the yellow-billed cuckoo.

5.5.14.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of yellow-billed cuckoo. Changes in points of diversion in Reaches 3–5 would lower groundwater levels sufficiently in these reaches to

reduce the extent or quality of 1,425 acres of yellow-billed cuckoo breeding, foraging, and migration habitat (see Table 5-5). The LCR MSCP would avoid the potential effects of lowering groundwater elevations on an additional 133 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh, thereby maintaining water levels and existing habitat conditions (see Table 5-3).

As described in Section 5.2.3.3, cottonwoods and willows that could provide habitat for the yellow-billed cuckoo may establish as Lake Mead reservoir elevations decline over the term of the LCR MSCP at the Lake Mead delta, Virgin River delta, Muddy River delta, and the portion of the Grand Canyon influenced by Lake Mead. Cottonwoods and willow that provide habitat would not likely establish except when the timing of when suitable substrates are wetted by changes in reservoir elevations coincides with the timing of cottonwood and willow seed dispersal. Yellow-billed cuckoo habitat is not currently present within the full pool elevation of Lake Mead and implementation of the covered activities will not result in immediate take of yellow-billed cuckoo. Cottonwoods and willows could establish under favorable reservoir conditions in the future and could be lost when reservoir elevations subsequently decline or rise sufficiently to respectively desiccate or inundate the habitat. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations over the term of the LCR MSCP cannot be predicted based on the available information. The periodic loss of this ephemeral habitat, however, could result in a low level of take of yellow-billed cuckoo over the term of the LCR MSCP.

As described in Section 5.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

5.5.14.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration and restoration projects; conversion of lands to agriculture) is expected to result in take of yellow-billed cuckoo. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting yellow-billed cuckoos. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 99 acres of yellow-billed cuckoo habitat could be removed to maintain channel functions (e.g., dredging desilting basins) and convert lands to agriculture (see Table 5-5). Activities associated with removal of habitat during the breeding season could result in mortality of eggs or nestlings. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. Some land cover types that are not considered to be species' habitat, but that may support some

transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

The creation of yellow-billed cuckoo habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of yellow-billed cuckoos in the LCR MSCP planning area. Consequently, the number of yellow-billed cuckoos exposed to disturbances by these types of non-flow-related activities is expected to increase in future years.

5.5.14.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining covered species habitat may result in take of yellow-billed cuckoo. LCR MSCP habitat creation–related activities could result in harassment of individuals if they are present at the time activities are implemented, but these activities would avoid removing primary habitat to establish habitat for other covered species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take that could be associated with removal of these land cover types.

Habitat management–related activities, such as periodic removal of trees in patches of created habitat to encourage stand regeneration and operation of equipment to maintain roads, could result in temporary loss of habitat and harassment of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 5,940 acres (i.e., the extent of cottonwood-willow land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood of take is expected to increase over the term of the LCR MSCP if the abundance of yellow-billed cuckoo increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

Implementation of the LCR MSCP Conservation Plan will create at least 4,050 acres of yellow-billed cuckoo habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of new habitat by 2,516 acres. LCR MSCP–created southwestern willow flycatcher habitat patches that are larger than 25 acres (Halterman pers. comm.) and support cottonwood-willow types I-III would provide

additional habitat for the yellow-billed cuckoo. In addition, the LCR MSCP Conservation Plan will maintain existing important yellow-billed cuckoo habitat areas in the LCR MSCP planning area.

5.5.15 Elf Owl

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the elf owl are expected to be minor, affecting a relatively small number of individuals and proportion of its habitat throughout its range over the term of the LCR MSCP. Within the LCR MSCP planning area, the effects of changes in points of diversion on cottonwood-willow land cover that provides habitat will be gradual and commensurate with the creation of higher value replacement habitats. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the elf owl, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the elf owl.

5.5.15.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of the owl. Changes in points of diversion in Reaches 3–5 would lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 161 acres of elf owl habitat (see Table 5-5). As described in Section 5.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

5.5.15.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh restoration projects; conversion of lands to agriculture) could result in take of elf owl. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting elf owls. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 590 acres of elf owl habitat could be converted to agricultural fields (see Table 5-5). Activities associated with removal of habitat during the breeding season could result in mortality of eggs or nestlings. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. Some land

cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

The creation of elf owl habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of elf owl in the LCR MSCP planning area. Consequently, the number of elf owls exposed to disturbances by these types of non-flow-related activities is expected to increase in future years.

5.5.15.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining covered species habitat may result in take of elf owl. LCR MSCP habitat creation–related activities could result in harassment of individuals if they are present at the time activities are implemented, but these activities would avoid removing primary habitat to establish habitat for other covered species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take that could be associated with removal of these land cover types.

Habitat management–related activities, such as periodic removal of trees in patches of created habitat to encourage stand regeneration and operation of equipment to maintain roads, could result in temporary loss of habitat and harassment of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 5,940 acres (i.e., the extent of cottonwood-willow land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood of take is expected to increase over the term of the LCR MSCP if the abundance of elf owl increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in the species habitat.

Implementation of the LCR MSCP Conservation Plan will create at least 1,784 acres of elf owl habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of new habitat by 1,033 acres.

5.5.16 Gilded Flicker

Implementation of the covered activities and LCR MSCP conservation measures could affect a substantial proportion of gilded flicker habitat throughout its present range over the term of the LCR MSCP. Within the LCR MSCP planning area, the effects of changes in points of diversion on cottonwood-willow land cover that provides habitat will be gradual and commensurate with the creation of higher value replacement habitats. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the gilded flicker, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the gilded flicker.

5.5.16.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of gilded flicker. Changes in points of diversion in Reaches 3–5 would lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 1,425 acres of gilded flicker habitat (see Table 5-5). The LCR MSCP would avoid the potential effects of lowering groundwater elevations on an additional 133 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh, thereby maintaining water levels and existing habitat conditions (see Table 5-3).

As described in Section 5.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

5.5.16.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh restoration projects; conversion of lands to agriculture) could result in take of gilded flicker. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting gilded flickers. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 99 acres of gilded flicker habitat could be removed to maintain channel functions (e.g., dredging desilting basins) and convert lands to agriculture (see Table 5-5). Activities associated with removal of habitat during the breeding season could result in mortality of eggs or nestlings. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. Some land cover types that are not considered to be species' habitat, but that may support some transitory

or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

The creation of gilded flicker habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of gilded flickers in the LCR MSCP planning area. Consequently, the number of gilded flickers exposed to disturbances by these types of non-flow-related activities is expected to increase in future years.

5.5.16.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining covered species habitat may result in take of gilded flicker. LCR MSCP habitat creation–related activities could result in harassment of individuals if they are present at the time activities are implemented, but these activities would avoid removing primary habitat to establish habitat for other covered species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take that could be associated with removal of these land cover types.

Habitat management–related activities, such as periodic removal of trees in patches of created habitat to encourage stand regeneration and operation of equipment to maintain roads, could result in temporary loss of habitat and harassment of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 5,940 acres (i.e., the extent of cottonwood-willow land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood of take is expected to increase over the term of the LCR MSCP if the abundance of gilded flicker increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

Implementation of the LCR MSCP Conservation Plan will create at least 4,050 acres of gilded flicker habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of new habitat by 2,516 acres.

5.5.17 Gila Woodpecker

Implementation of the covered activities and LCR MSCP conservation measures could affect a substantial proportion of Gila woodpecker habitat provided by cottonwood-willow land cover in the LCR MSCP planning area. In the LCR MSCP planning area, the effects of changes in points of diversion on cottonwood-willow land cover that provides habitat would be gradual, commensurate with the creation of higher-value replacement habitats. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize the direct effects of implementing covered activities and the LCR MSCP on Gila woodpecker. The potential effects of habitat loss are expected to be minimized through creation of replacement habitat. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the Gila woodpecker.

5.5.17.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of Gila woodpecker. Changes in points of diversion in Reaches 3–5 would lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 819 acres of Gila woodpecker habitat (see Table 5-5). As described in Section 5.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

5.5.17.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration and restoration projects; conversion of lands to agriculture) is expected to result in take of Gila woodpecker. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting Gila woodpeckers. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 26 acres of Gila woodpecker habitat could be removed to maintain channel functions (e.g., dredging desilting basins) and convert lands to agriculture (see Table 5-5). Activities associated with removal of habitat during the breeding season could result in mortality of eggs or nestlings. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however,

will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

The creation of Gila woodpecker habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of Gila woodpecker in the LCR MSCP planning area. Consequently, the number of Gila woodpeckers exposed to disturbances by these types of non-flow-related activities is expected to increase in future years.

5.5.17.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining covered species habitat may result in take of Gila woodpecker. LCR MSCP habitat creation–related activities could result in harassment of individuals if they are present at the time activities are implemented, but these activities would avoid removing primary habitat to establish habitat for other covered species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., dry patches of saltcedar and saltcedar-dominated land cover types) by individuals, could be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take that could be associated with removal of these land cover types.

Habitat management–related activities, such as periodic removal of trees in patches of created habitat to encourage stand regeneration and operation of equipment to maintain roads, could result in temporary loss of habitat and harassment of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 5,940 acres (i.e., the extent of cottonwood-willow land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood of take is expected to increase over the term of the LCR MSCP if the abundance of Gila woodpecker increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

Implementation of the LCR MSCP Conservation Plan will create at least 1,702 acres of Gila woodpecker habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of new habitat by 847 acres.

5.5.18 Vermilion Flycatcher

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the vermilion flycatcher are expected to be minor, affecting a relatively small number of individuals and proportion of its habitat throughout its range over the term of the LCR MSCP. Within the LCR MSCP planning area, the effects of changes in points of diversion on cottonwood-willow land cover that provides habitat will be gradual and commensurate with the creation of higher value replacement habitats. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the vermilion flycatcher, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the vermilion flycatcher.

5.5.18.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of vermilion flycatcher. Changes in points of diversion in Reaches 3–5 will lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 1,890 acres of cottonwood-willow types I–V that provide vermilion flycatcher nesting, foraging, and migration habitat (see Table 5-5). The LCR MSCP will avoid the potential effects of lowering groundwater elevations on an additional 133 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh, thereby maintaining water levels and existing habitat conditions (see Table 5-3).

As described in Section 5.2.3.3, cottonwoods and willows that could provide habitat for the vermilion flycatcher may establish as Lake Mead reservoir elevations decline over the term of the LCR MSCP at the Lake Mead delta, Virgin River delta, Muddy River delta, and the portion of the Grand Canyon influenced by Lake Mead. Cottonwoods and willow that provide habitat would not likely establish except when the timing of when suitable substrates are wetted by changes in reservoir elevations coincides with the timing of cottonwood and willow seed dispersal. Vermilion flycatcher habitat is not currently present within the full pool elevation of Lake Mead and implementation of the covered activities will not result in immediate take of vermilion flycatcher. Cottonwoods and willows could establish under favorable reservoir conditions in the future and could be lost when reservoir elevations subsequently decline or rise sufficiently to respectively desiccate or inundate the habitat. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations over the term of the LCR MSCP cannot, however, be predicted based on the available information. The periodic loss of this ephemeral habitat, however, could result in a low level of take of vermilion flycatcher over the term of the LCR MSCP.

As described in Section 5.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

5.5.18.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration and restoration projects; conversion of lands to agriculture) could result in take of vermilion flycatcher. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting vermilion flycatchers. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 714 acres of vermilion flycatcher habitat could be removed to maintain channel functions (e.g., dredging desilting basins) and convert lands to agriculture (see Table 5-5). Activities associated with removal of habitat during the breeding season could result in mortality of eggs or nestlings. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide over the term of the LCR MSCP.

The creation of vermilion flycatcher habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of vermilion flycatcher in the LCR MSCP planning area. Consequently, the number of vermilion flycatchers exposed to disturbances by these types of non-flow-related activities is expected to increase in future years.

5.5.18.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created covered species habitat may result in take of vermilion flycatcher. LCR MSCP habitat creation–related activities could result in harassment of individuals if they are present at the time activities are implemented, but these activities would avoid removing primary habitat to establish habitat for other covered species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR

MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take that could be associated with removal of these land cover types.

Habitat management–related activities, such as periodic removal of trees in patches of created habitat to encourage stand regeneration and operation of equipment to maintain roads, could result in temporary loss of habitat and harassment of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 7,260 acres (i.e., the extent of cottonwood-willow and honey mesquite land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood of take is expected to increase over the term of the LCR MSCP if the abundance of vermilion flycatcher increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

Implementation of the LCR MSCP Conservation Plan will create at least 5,208 acres of vermilion flycatcher habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of new habitat by 2,594 acres.

5.5.19 Arizona Bell's Vireo

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the Arizona Bell's vireo are expected to be minor, affecting a relatively small number of individuals and proportion of its habitat throughout its range over the term of the LCR MSCP. Within the LCR MSCP planning area, the effects of changes in points of diversion on cottonwood-willow land cover that provides habitat will be gradual and commensurate with the creation of higher value replacement habitats. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the Arizona Bell's vireo, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the Arizona Bell's vireo.

5.5.19.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of Arizona Bell's vireo. Changes in points of diversion in Reaches 3–5 would lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 1,654 acres of Arizona Bell's vireo habitat (see Table 5-5). The LCR MSCP would avoid the potential effects of lowering groundwater elevations on an additional 133 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh, thereby maintaining of water levels and existing habitat conditions (see Table 5-3).

As described in Section 5.2.3.3, cottonwoods and willows that could provide habitat for the Arizona Bell's vireo may establish as Lake Mead reservoir elevations decline over the term of the LCR MSCP at the Lake Mead delta, Virgin River delta, Muddy River delta,

and the portion of the Grand Canyon influenced by Lake Mead. Cottonwoods and willow that provide habitat would not likely establish except when the timing of when suitable substrates are wetted by changes in reservoir elevations coincides with the timing of cottonwood and willow seed dispersal. Arizona Bell's vireo habitat is not currently present within the full pool elevation of Lake Mead and implementation of the covered activities will not result in immediate take of Arizona Bell's vireo. Cottonwoods and willows could establish under favorable reservoir conditions in the future and could be lost when reservoir elevations subsequently decline or rise sufficiently to respectively desiccate or inundate the habitat. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations over the term of the LCR MSCP cannot be predicted based on the available information. The periodic loss of this ephemeral habitat, however, could result in a low level of take of Arizona Bell's vireo over the term of the LCR MSCP.

As described in Section 5.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

5.5.19.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gauge station, and other facility maintenance activities; implementation of marsh and riparian restoration and restoration projects; conversion of lands to agriculture) could result in take of Arizona Bell's vireo. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting Arizona Bell's vireos. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 1,309 acres of Arizona Bell's vireo habitat could be removed to maintain channel functions (e.g., dredging desilting basins) and convert lands to agriculture (see Table 5-5). Up to an additional 3,832 acres of honey mesquite type IV that provides habitat could be removed by Federal non-flow-related activities; however, these activities and resultant impacts are not covered under the LCR MSCP. Activities associated with removal of habitat during the breeding season could result in mortality of eggs or nestlings. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

5.5.19.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining covered species habitat may result in take of Arizona Bell's vireo. LCR MSCP habitat creation–related activities could result in harassment of individuals if they are present at the time activities are implemented, but these activities would avoid removing primary habitat to establish habitat for other covered species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take that could be associated with removal of these land cover types.

Habitat management–related activities, such as periodic removal of trees in patches of created habitat to encourage stand regeneration and operation of equipment to maintain roads, could result in temporary loss of habitat and harassment of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 7,260 acres (i.e., the extent of cottonwood-willow land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood of take is expected to increase over the term of the LCR MSCP if the abundance of Arizona Bell's vireo increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

Implementation of the LCR MSCP Conservation Plan will create at least 2,983 acres of Arizona Bell's vireo habitat to replace habitat that could be lost as a result of covered activities.

5.5.20 Sonoran Yellow Warbler

Implementation of the covered activities and LCR MSCP conservation measures could affect a substantial proportion of Sonoran yellow warbler habitat throughout its present range over the term of the LCR MSCP. In the LCR MSCP planning area, the effects of changes in points of diversion on cottonwood-willow land cover that provides habitat would be gradual, commensurate with the creation of higher value replacement habitats. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize the direct effects of implementing covered activities and the LCR MSCP on Sonoran yellow warbler, and the potential effects of habitat loss are expected to be minimized through creation of replacement habitat. For the reasons described below,

implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the Sonoran yellow warbler.

5.5.20.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of Sonoran yellow warbler. Changes in points of diversion in Reaches 3–5 would lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 2,929 acres of Sonoran yellow warbler habitat (see Table 5-5). The LCR MSCP would avoid the potential effects of lowering groundwater elevations on an additional 2,224 acres of habitat at Topock Marsh by maintaining water deliveries to Topock Marsh, thereby maintaining water levels and existing conditions (see Table 5-3).

As described in Section 5.2.3.3, riparian vegetation that could provide habitat for the Sonoran yellow warbler may establish as Lake Mead reservoir elevations decline over the term of the LCR MSCP at the Lake Mead delta, Virgin River delta, Muddy River delta, and the portion of the Grand Canyon influenced by Lake Mead. Sonoran yellow warbler habitat is not currently present within the full pool elevation of Lake Mead and implementation of the covered activities will not result in immediate take of Sonoran yellow warbler. Riparian vegetation that provides habitat could establish under favorable reservoir conditions in the future and could be lost or degraded when reservoir elevations subsequently decline or rise sufficiently to respectively desiccate or inundate the habitat. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations over the term of the LCR MSCP cannot be predicted based on the available information. The periodic loss of this ephemeral habitat, however, could result in a low level of take of Sonoran yellow warbler over the term of the LCR MSCP.

As described in Section 5.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of habitat over the term of the LCR MSCP.

5.5.20.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gauge station, and other facility maintenance activities; implementation of marsh and riparian restoration and restoration projects; conversion of lands to agriculture) could result in take of Sonoran yellow warbler. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting Sonoran yellow warbler. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 183 acres of Sonoran yellow warbler habitat could be removed to maintain channel functions (e.g., dredging desilting basins) and convert lands to agriculture (see Table 5-

5). Activities associated with removal of habitat during the breeding season could result in mortality of eggs or nestlings. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of habitat over the term of the LCR MSCP.

5.5.20.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining covered species habitat may result in take of Sonoran yellow warbler. LCR MSCP habitat creation–related activities could result in temporary disturbance of habitat and harassment of individuals if they are present at the time activities are implemented, but these activities would avoid removing primary habitat to establish habitat for other covered species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., dry patches of saltcedar and saltcedar-dominated land cover types) by individuals, could be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take that could be associated with removal of these land cover types.

Habitat management–related activities, such as periodic removal of trees in patches of created habitat to encourage stand regeneration and operation of equipment to maintain roads, could result in temporary loss of habitat and harassment of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 5,940 acres (i.e., the extent of cottonwood-willow land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood of take is expected to increase over the term of the LCR MSCP if the abundance of Sonoran yellow warbler increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

Implementation of the LCR MSCP Conservation Plan will create at least 4,050 acres of Sonoran yellow warbler habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of new habitat by 928 acres.

5.5.21 Summer Tanager

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the summer tanager are expected to be minor, affecting a relatively small number of individuals and proportion of its habitat throughout its range over the term of the LCR MSCP. Within the LCR MSCP planning area, the effects of changes in points of diversion on cottonwood-willow land cover that provides habitat will be gradual and commensurate with the creation of higher value replacement habitats. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the summer tanager, and the potential effects of habitat loss are expected to be minimized with the creation of replacement habitat. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the summer tanager.

5.5.21.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of summer tanager. Changes in points of diversion in Reaches 3–5 would lower groundwater levels sufficiently in these reaches to reduce the extent or quality of 161 acres of habitat (see Table 5-5).

As described in Section 5.2.3.3, cottonwoods and willows that could provide habitat for the summer tanager may establish as Lake Mead reservoir elevations decline over the term of the LCR MSCP at the Lake Mead delta, Virgin River delta, Muddy River delta, and the portion of the Grand Canyon influenced by Lake Mead. Cottonwoods and willow that provide habitat would not likely establish except when the timing of when suitable substrates are wetted by changes in reservoir elevations coincides with the timing of cottonwood and willow seed dispersal. Summer tanager habitat is not currently present within the full pool elevation of Lake Mead and implementation of the covered activities will not result in immediate take of summer tanager. Cottonwoods and willows could establish under favorable reservoir conditions in the future and could be lost when reservoir elevations subsequently decline or rise sufficiently to respectively desiccate or inundate the habitat. The frequency, extent, and value of habitat and attendant species benefits that could be periodically created and subsequently lost as a result of changes in reservoir elevations over the term of the LCR MSCP cannot be predicted based on the available information. The periodic loss of this ephemeral roosting habitat, however, could result in a low level of take of summer tanager over the term of the LCR MSCP.

As described in Section 5.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

5.5.21.2 Effects of Federal Non-Flow-Related Covered Activities

Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities; implementation of marsh and riparian restoration and restoration projects; conversion of lands to agriculture) may result in take of summer tanager. Noise, artificial lighting, and dust may have indirect effects, well beyond the construction areas, on nesting summer tanagers. Such effects may include displacement of nesting pairs or decreased reproductive success. Equipment operation and associated activities are expected to result in some low level of take over the term of the LCR MSCP.

Up to 14 acres of summer tanager habitat could be removed to maintain channel functions (e.g., dredging desilting basins) (see Table 5-5). Activities associated with removal of habitat during the breeding season could result in mortality of eggs or nestlings. These activities are expected to result in some low level of take over the term of the LCR MSCP. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be converted to agriculture. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan, however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of cottonwood-willow land cover types that provide habitat over the term of the LCR MSCP.

The creation of summer tanager habitat through implementation of the LCR MSCP Conservation Plan is expected to result in an increase in the numbers and distribution of summer tanagers in the LCR MSCP planning area. Consequently, the number of summer tanagers exposed to disturbances by these types of non-flow-related activities is expected to increase in future years.

5.5.21.3 Effects of LCR MSCP Implementation

Activities associated with creating and maintaining created covered species habitat may result in take of summer tanager. LCR MSCP habitat creation–related activities could result in harassment of individuals if they are present at the time activities are implemented, but these activities would avoid removing primary habitat to establish habitat for other covered species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could be converted to habitat to benefit other covered species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR

MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take that could be associated with removal of these land cover types.

Habitat management–related activities, such as periodic removal of trees in patches of created habitat to encourage stand regeneration and operation of equipment to maintain roads, could result in temporary loss of habitat and harassment of individuals. The maximum extent of habitat that could be affected by habitat management activities is estimated to be 5,940 acres (i.e., the extent of cottonwood-willow land cover to be created as habitat for associated covered species) over the term of the LCR MSCP. The likelihood of take is expected to increase over the term of the LCR MSCP if the abundance of summer tanager increases in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. The level of adverse effects on habitats and individuals will depend on the type and extent of LCR MSCP habitat management activities that are undertaken in species habitat.

Implementation of the LCR MSCP Conservation Plan will create at least 602 acres of summer tanager habitat to replace habitat that could be lost as a result of covered activities and will increase the amount of protected new habitat by 427 acres.

5.5.22 Flat-Tailed Horned Lizard

Flow-related activities will not affect the desert scrub communities inhabited by the flat-tailed horned lizard. Flow-related covered activities, therefore, are unlikely to result in take of the flat-tailed horned lizard. The potential effects of implementing non-flow-related covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the flat-tailed horned lizard are expected to be minor, potentially affecting a small number of individuals and small patches of habitat. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the flat-tailed horned lizard. For the reasons described below, implementation of the non-flow-related covered activities and the LCR MSCP is likely to adversely affect the flat-tailed horned lizard.

5.5.22.1 Effects of Federal Non-Flow-Related Covered Activities

Conversion of lands to agriculture in Reaches 6 and 7 and activities associated with maintaining the 242 Well Field and Lateral near the SIB would result in take of flat-tailed horned lizard. Conversion of lands to agriculture would remove habitat, and operation of equipment necessary to convert lands and farm fields would result in harassment and mortality of individuals. This species inhabits sites that support sparsely vegetated fine sands. Species habitat cannot be directly correlated to mapped LCR MSCP land cover types, but could be present as inclusions within desert scrub and riparian land cover types in Reaches 6 and 7. The extent of habitat loss is estimated to be up to 10 percent of the total extent of desert scrub and riparian land cover types that would be converted to agricultural uses in Reaches 6 and 7. Up to 1,280 acres of desert scrub and riparian land cover could be converted to agricultural uses; therefore, based on this assumption, up to 128 acres of flat-tailed horned lizard habitat could be removed by these activities (see

Table 5-5). Channel maintenance–related activities would be implemented adjacent to the river channel, where this species and its habitat are not expected to be present.

Activities to maintain the 242 Well Field include controlling weeds, cleaning the lateral, grading and graveling access roads, and repairing or replacing infrastructure. Operation of vehicles and other equipment to implement these activities could result in direct mortality of individual lizards. Operation of equipment can crush lizards in underground burrows or on the surface in locations where maintenance activities are undertaken, or lizards present along roadways may be struck by vehicles (U.S. Fish and Wildlife Service 1997). These activities are expected to result in low level of take over the term of the LCR MSCP.

Implementation of ongoing non-flow-related covered activities are not expected to result in indirect effects on the flat-tailed horned lizard.

5.5.22.2 Effects of LCR MSCP Implementation

Activities associated with establishing and managing LCR MSCP–created covered species habitat may result in take of flat-tailed horned lizard. It is unlikely that LCR MSCP covered species habitats would be created in flat-tailed horned lizard habitat because site conditions associated with its habitat likely would be unsuitable for creation of other habitat. To the extent practicable, construction of new infrastructure that may be required to establish and maintain conservation areas in Reaches 6 and 7 would be designed to avoid flat-tailed horned lizard habitat. However, harassment and mortality of individuals could be associated with habitat establishment and maintenance activities (e.g., operation of vehicles and equipment). These activities, therefore, could result in a low level of take.

Implementation of the LCR MSCP Conservation Plan will protect 230 acres of unprotected occupied flat-tailed horned lizard habitat to mitigate the loss of up to 128 acres of flat-tailed horned lizard habitat as a result of implementing covered activities. The acquired habitat will be transferred to an appropriate management agency for permanent protection of habitat for the species.

5.5.23 Relict Leopard Frog

The potential effects of implementing the covered activities and LCR MSCP conservation measures on distribution and status of the relict leopard frog are expected to be minor, potentially affecting a small number of individuals and small patches of habitat. The LCR MSCP Conservation Plan includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the relict leopard frog. For the reasons described below, implementation of the flow-related covered activities and the LCR MSCP is likely to adversely affect relict leopard frog.

5.5.23.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of relict leopard frog. Relict leopard frog inhabits springs in Black Canyon in Reach 2. Although relict leopard frog breeds in springs, it has been observed in the mainstem of the LCR in Reach 2, which likely serves as a corridor for movement among patches of habitat. Changes in flow releases from Hoover Dam associated with implementation of flow-related covered activities could disrupt use of the corridor (e.g., cold-water flow releases) and may result in a low level of take of relict leopard frog. Effects of ongoing flow releases from Hoover Dam on the use of the LCR as a movement corridor by the relict leopard frog will be the same as those associated with past operations.

5.5.23.2 Effects of LCR MSCP Implementation

It is unlikely that LCR MSCP created habitats will be established in or near relict leopard frog habitat. However, if created habitat were to be established in occupied relict leopard frog habitat, the created habitat would be designed to provide habitat for the relict leopard frog as well as for other appropriate covered species. Maintenance of created habitats occupied by relict leopard frogs or that are located near occupied habitat, could result in some unquantified level of harassment and mortality of individuals.

Implementation of the LCR MSCP Conservation Plan will benefit the relict leopard frog by funding planned, but unfunded, research and conservation measures to be undertaken through existing programs, as appropriate. Implementation of these measures will help ensure that the existing abundance of the species in and adjacent to the LCR MSCP planning area is maintained or increased.

5.5.24 Flannelmouth Sucker

The potential effects of implementing covered activities and LCR MSCP conservation measures on the rangewide distribution and status of the flannelmouth sucker are expected to be minor, affecting a relatively small number of individuals and proportion of its habitat throughout its range over the term of the LCR MSCP. The LCR MSCP Conservation Plan includes conservation measures to replace habitat affected by covered activities and research to collect information necessary to direct future management of the species. For the reasons described below, implementation of the flow-related and non-flow-related covered activities, and the LCR MSCP is likely to adversely affect the flannelmouth sucker.

5.5.24.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of flannelmouth sucker. Changes in flow in Reach 3 would result in the loss of 85 acres of flannelmouth sucker habitat (see Table 5-5). Spawning during spring has been observed in Reach 3 in glides or slow riffles over medium-coarse gravel substrate. The reduced depth associated with reduced flows could

result in the loss of up to 53 acres of spawning habitat. Juvenile flannelmouth suckers use sheltered shorelines and backwaters. Backwaters are warmer and more productive than the main river channel, potentially supporting faster fish growth rates. In addition, backwaters with emergent vegetation provide cover and refuge from predators. Reduced flow and shallower depth could result in the loss of up to 32 acres of rearing habitat. Reduced flow may also increase stranding losses where daily flow variability isolates and desiccates occupied habitat. Effects of ongoing flow-related covered activities on the flannelmouth sucker would be the same as those described in Section 5.5.6 for the razorback sucker, except that the analysis is limited to Reach 3.

Based on the potential for entrainment of razorback suckers in water diversions (Bureau of Reclamation 1996), diversions from the river could entrain flannelmouth sucker, but potential entrainment losses would be minimal. There are relatively few diversions directly from the river segment of Reach 3, and the diversions are small relative to river flow.

Changes in reservoir elevations associated with implementation of flow-related covered activities could result in the establishment of transitory segments of the Colorado River and Virgin River, when the reservoir pool is maintained at lower elevations that could be occupied by flannelmouth sucker. These transitory river segments would be lost when the reservoir pool elevation is increased. Over the term of the LCR MSCP reservoir operations are expected to result in some low level of take.

5.5.24.2 Effects of Federal Non-Flow-Related Covered Activities

Implementation of non-flow-related covered activities to maintain the stable location and slope of the river channel, including dredging, bank maintenance, and maintenance of levees, jetties, and training structures, may result in take of flannelmouth sucker in Reach 3. Effects on flannelmouth sucker would be temporary, generally encompassing the period of construction. Dredging may remove potential spawning and rearing habitat associated with wash fans. Dredging and maintenance activities would temporarily remove food organisms and cover from the dredged areas of the river channel and backwaters. Placement of riprap and the removal of shoreline vegetation could reduce channel-edge complexity, subsequently reducing cover from predator species and production of invertebrates that are food for fish (Hicks et al. 1991). Increased turbidity caused by dredging and maintenance activities could cause sedimentation of spawning and rearing habitat. Sedimentation could suffocate eggs and larvae and reduce the production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect survival, growth, and reproduction. These activities are expected to result in some low level of take over the term of the LCR MSCP. As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of the river channel and backwaters that provide habitat over the term of the LCR MSCP.

In addition to causing effects on habitat, dredging and maintenance of banks, levees, jetties, and training structures could cause direct mortality or cause fish to temporarily

avoid using affected habitat. Direct mortality could result from entrainment into the dredge intake or physical trauma to the organisms. Adult and juvenile fish may move away from affected habitat. These activities are expected to result an level of take over the term of the LCR MSCP.

Dredging backwaters and the areas surrounding jetties and training structures would maintain flow continuity between the backwaters and the river and would maintain the backwater area and depth. Flannelmouth sucker may benefit from maintenance of backwaters because backwaters along the LCR provide habitat (Bradford et al. 1998). Improved flow continuity in the backwaters will improve access and maintain water quality.

Construction and maintenance of fish grow-out coves, fishing docks, fish attraction structures, and boat ramps in Lake Mohave would disturb and cover up the reservoir bottom. Only a small area of potential spawning and rearing habitat would be removed as a result of construction; this removal would not be expected to adversely affect flannelmouth sucker. Temporary adverse effects could be associated with increased turbidity and contaminants contributed by construction and maintenance activities, which could affect spawning and rearing habitat. Sedimentation could suffocate eggs and larvae and reduce the production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect survival, growth, and reproduction. These activities are expected to result in a low level of take over the term of the LCR MSCP.

In addition to effects on habitat, construction and resulting recreational activities associated with fishing docks, artificial fish habitats, and boat ramps at Lake Mohave could cause direct mortality or cause fish to temporarily avoid using affected habitat. Direct mortality could result from physical trauma to individual fish during construction or through capture by recreational anglers. Adult and juvenile fish may move away from affected habitat. In addition, these artificial habitats designed for nonnative fish species may adversely affect flannelmouth sucker by increasing local predator density. These activities are expected to result in a low level of take over the term of the LCR MSCP.

5.5.24.3 Effects of LCR MSCP Implementation

Construction-related activities associated with establishing and managing LCR MSCP–created covered species habitat in Reach 3 may result in take of flannelmouth sucker. The adverse effects of habitat construction and maintenance activities on flannelmouth sucker would be temporary, generally occurring during the period of construction. Habitat creation–related construction and maintenance activities may:

- cause juvenile and adult fish to temporarily avoid using affected habitat;
- increase turbidity and cause sedimentation of spawning and rearing habitat, which could suffocate eggs and larvae and temporarily reduce production and availability of food organisms; and

- result in accidental discharge of contaminants or cause resuspension of contaminants from disturbed sediments, which could adversely affect the survival, growth, and reproduction of flannelmouth sucker.

Although construction and maintenance activities could adversely affect flannelmouth sucker and its habitat in Reach 3, the extent of habitat disturbed would be small, the disturbance would be temporary, and the effects would be minimal.

Control of competitor and predator species in created backwaters occupied by flannelmouth sucker may also inadvertently capture, injure, or result in mortality of individual flannelmouth sucker. Stocking razorback suckers in flannelmouth sucker habitat may result in hybridization, which may affect the flannelmouth population.

Buhl and Hamilton (1996) found that mixtures of inorganics derived from irrigation activities may have an adverse effect on larval and juvenile bonytail and razorback sucker in the Green River. Establishment and maintenance of LCR MSCP–created habitats, however, are not expected to increase contaminant concentrations above existing levels. Establishment and maintenance of LCR MSCP habitats are not expected to require pesticide use that could diminish habitat value for terrestrial species, so creation of habitat on agricultural lands would likely result in an overall decrease in contaminant concentrations, or in no net change for nonagricultural sites. Runoff/return flow from habitat creation sites would be minimized to the greatest extent possible. Therefore, contaminants associated with runoff from LCR MSCP habitats are unlikely to adversely affect flannelmouth sucker.

Implementation of the LCR MSCP Conservation Plan conservation measures, including creation of 85 acres of habitat and funding research to determine the management needs of the flannelmouth sucker in the LCR, will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained. Research undertaken by the LCR MSCP will provide the information necessary to identify future management actions that could be undertaken by the LCR MSCP or others that will benefit the species.

5.5.25 MacNeill's Sootywing Skipper

Implementation of covered activities and the LCR MSCP conservation measures could affect a substantial proportion of the extent of known MacNeill's sootywing skipper habitat. The degree to which changes in points of diversion would affect the future distribution and status of MacNeill's sootywing skipper compared to existing conditions is uncertain. The effects of covered activities on the distribution and status of the MacNeill's sootywing skipper, however, are expected to be minimized over the term of the LCR MSCP because the effects of changes in points of diversion on moist soils required by the species will be gradual and commensurate with the creation of higher value replacement habitats. The LCR MSCP Conservation Plan also includes conservation measures to avoid and minimize direct effects of implementing covered activities and the LCR MSCP on the MacNeill's sootywing skipper and research to collect information necessary to direct future management of the species. For the reasons described below, implementation of the flow-related and non-flow-related covered

activities, and the LCR MSCP is likely to adversely affect the MacNeill's sootywing skipper.

5.5.25.1 Effects of Flow-Related Covered Activities

Flow-related activities may result in take of MacNeill's sootywing skipper. Changes in flow in Reaches 3 and 4 would result in the degradation or loss of 172 acres of adjoining patches of atriplex and honey mesquite land cover that provide MacNeill's sootywing skipper habitat (see Table 5-5). Reductions in groundwater elevations are not expected to affect quail bush or honey mesquite plants used by the species. However, reduction in groundwater elevations could be sufficient to degrade or eliminate the microhabitat conditions, maintained by high groundwater elevations, that are necessary to sustain MacNeill's sootywing skipper.

As described in Section 5.2.2.3, effects of ongoing flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of habitat over the term of the LCR MSCP.

5.5.25.2 Effects of Federal Non-Flow-Related Covered Activities

Conversion of lands to agricultural uses could remove up to 50 acres of MacNeill's sootywing skipper habitat (Table 5-5). Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and other facility maintenance activities) could result in take of MacNeill's sootywing skipper. These activities would, to the extent practicable, avoid removing MacNeill's sootywing skipper habitat. However, these activities may result in some low level of disturbance or loss of habitat over the term of the LCR MSCP. Non-flow-related activities associated with operation of equipment near existing populations may result in direct take of individuals.

As described in Section 5.2.2.3, indirect effects of ongoing non-flow-related covered activities could contribute to a minimal and unquantifiable level of degradation of habitat over the term of the LCR MSCP.

5.5.25.3 Effects of LCR MSCP Implementation

Habitat creation–related activities may result in take of MacNeill's sootywing skipper. LCR MSCP habitat creation–related activities would avoid removing MacNeill's sootywing skipper habitat. However, LCR MSCP activities related to establishing and managing created habitat, such as operation of vehicles and equipment, could result in mortality of individuals if they are present when such activities are undertaken. It is likely that activities associated with the creation of MacNeill's sootywing skipper habitat would result in such take because it will be desirable to locate created habitat adjacent to

or near occupied habitat to facilitate the use of the new habitat by MacNeill's sootywing skippers.

Implementation of the LCR MSCP Conservation Plan will create at least 200 acres of MacNeill's sootywing skipper habitat to replace habitat removed as a result of implementing covered activities and will help ensure that the existing abundance of the species in the LCR MSCP planning area is maintained.

5.5.26 Sticky Buckwheat

Sticky buckwheat is a rare annual plant; its distribution is centered in the Muddy and Virgin River drainages. Regionally significant populations occur around the Overton Arm shoreline of Lake Mead, including some locations that are below the full-pool elevation (Niles et al. 1995, 1997; National Park Service 1999). Federal non-flow-related covered activities and implementation of the LCR MSCP are not expected to result in take of sticky buckwheat. This species occurs in mixed Mojave desert scrub communities that are not expected to be affected by non-flow-related covered activities, and implementation of the LCR MSCP Conservation Plan would avoid effects on the species.

The potential effects of implementing covered activities and LCR MSCP conservation measures on distribution and status of the sticky buckwheat are expected to be minor, affecting only plants that become established in transitory shoreline habitats that are created when Lake Mead reservoir elevations are below full pool and that are inundated when reservoir elevations subsequently rise. For the reasons described below, implementation of the flow-related covered activities, and the LCR MSCP is likely to adversely affect the sticky buckwheat.

5.5.26.1 Effects of Flow-Related Covered Activities

Implementation of ongoing and future flow-related covered activities may result in impacts on sticky buckwheat. Sticky buckwheat can establish on suitable soils that become exposed when the Lake Mead reservoir is below its full-pool elevation. Changes in reservoir elevations associated with flow-related covered activities could result in some low level of take of sticky buckwheat plants that have established below the full-pool elevation because reservoir elevations could rise and inundate these plants.

5.5.27 Threecorner Milkvetch

Threecorner milkvetch is an annual plant whose distribution is limited. In and adjacent to the LCR MSCP planning area, it is rare and occurs locally along the lower Muddy, Virgin, and Colorado Rivers. Federal non-flow-related covered activities and LCR MSCP implementation would not result in take of threecorner milkvetch. It is typically associated with creosote bush scrub, which is not expected to be affected by non-flow-

related covered activities, and implementation of the LCR MSCP Conservation Plan would avoid effects on the species.

The potential effects of implementing covered activities and LCR MSCP conservation measures on distribution and status of the threecorner milkvetch are expected to be minor, only affecting plants that become established in transitory shoreline habitats that are created when Lake Mead reservoir elevations are below full pool and that are inundated when reservoir elevations subsequently rise. For the reasons described below, implementation of the flow-related covered activities, and the LCR MSCP is likely to adversely affect the threecorner milkvetch.

5.5.27.1 Effects of Flow-Related Covered Activities

Implementation of ongoing and future flow-related covered activities may result in impacts on threecorner milkvetch. Threecorner milkvetch can establish on suitable soils that become exposed when the Lake Mead reservoir is below its full-pool elevation. Changes in reservoir elevations associated with implementation of flow-related covered activities could result in some low level of take of threecorner milkvetch plants that have established below the full-pool elevation because reservoir elevations could rise and inundate plants.

5.5.28 Effects on Evaluation Species

5.5.28.1 California Leaf-Nosed Bat

The California leaf-nosed bat is a year-round resident in all reaches of the LCR. It roosts in caves or mines close to riparian areas and forages near open water in all land cover types where insect prey are abundant. Lowering of groundwater elevations could reduce the production and abundance of insect prey as a result of changes in the extent, frequency, and duration that surface water or moist soil surface conditions are present in patches of riparian land cover. There is currently insufficient information to determine whether reduction in groundwater levels would reduce the abundance of insect prey species sufficiently to affect the California leaf-nosed bat. Non-flow-related covered activities and LCR MSCP implementation are not expected to affect roost sites and, therefore, are not expected to result in take of the California leaf-nosed bat.

Implementation of the LCR MSCP conservation measures that will maintain or increase the production of insect food items will fully mitigate flow-related effects, if any, on the diversity and production of insects. In addition, implementation of survey and research conservation measures will provide important information for use in developing future conservation efforts for this species.

5.5.28.2 Pale Townsend's Big-Eared Bat

The pale Townsend's big-eared bat is a year-round resident along all reaches of the MSCP planning area (Hall 1946). Maternity and day roosts are generally located in mines or caves; night roosts may be in buildings or other structures. Lowering of groundwater elevations could reduce the production and abundance of insect prey as a result of changes in the extent, frequency, and duration that surface water or moist soil surface conditions are present in patches of riparian land cover. There is currently insufficient information to determine whether reduction in groundwater levels would reduce the abundance of insect prey species sufficiently to affect the pale Townsend's big-eared bat. Non-flow-related covered activities and LCR MSCP implementation are not expected to affect roost sites and, therefore, are not expected to result in take of the pale Townsend's big-eared bat.

Implementation of the LCR MSCP conservation measures that will maintain or increase the production of insect food items will fully mitigate flow-related effects, if any, on the diversity and production of insects. In addition, implementation of survey and research conservation measures will provide important information for use in developing future conservation efforts for this species.

5.5.28.3 Colorado River Toad

The Colorado River toad is a semiaquatic amphibian associated with Sonoran desert tortoise habitats that was last observed in the LCR MSCP planning area in 1984 in Reach 4 on the Arizona side of the Cibola NWR. Because the Colorado River toad is not present in the LCR MSCP planning area, implementation of flow-related covered activities, non-flow-related covered activities, and the LCR MSCP will not result in take of the Colorado River toad.

Implementation of the LCR MSCP conservation measures to conduct research to determine the species status and life requirements and techniques for reestablishing occurrences of the Colorado River toad will provide information necessary for successful management to maintain and increase the abundance of the Colorado River toad throughout its range.

5.5.28.4 Lowland Leopard Frog

The lowland leopard frog is not known to occur in the LCR MSCP planning area but does occur near the LCR MSCP planning area at the Bill Williams River NWR, approximately 7 miles upstream from the Colorado River in Reach 3. Because the lowland leopard frog is not present in the LCR MSCP planning area, implementation of flow-related covered activities, non-flow-related covered activities, and the LCR MSCP will not result in take of the lowland leopard frog.

Implementation of the LCR MSCP conservation measures to conduct research to determine the status and life requirements and techniques for reestablishing occurrences of the lowland leopard frog will provide information necessary for successful

management to maintain and increase the abundance of lowland leopard frogs throughout its range.

5.6 Effects of Non-Federal Non-Flow-Related Covered Activities

5.6.1 Yuma Clapper Rail

Proposed activities related to habitat restoration and maintenance projects, facilities and infrastructure maintenance, and operation of watercraft for law enforcement along the LCR may result in take of Yuma clapper rail. The likelihood of take is expected to increase over the term of the LCR MSCP if Yuma clapper rail becomes more abundant in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary or permanent loss of habitat and harassment or mortality of individuals. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. Effects on habitat would be temporary for restoration projects that restore or improve existing Yuma clapper rail habitat. The probability of permanent loss of habitat is considered minimal because restoration projects undertaken in existing Yuma clapper rail habitat would be designed to maintain or improve its habitat, and it is unlikely that state fish and wildlife agencies would remove Yuma clapper rail habitat to restore habitat for other species. However, because habitat restoration sites have not yet been identified, it is assumed that up to 10 acres of degraded or former marsh that provides low-value habitat could be removed over the term of the LCR MSCP to restore habitat for other species.

Activities associated with maintaining facilities and infrastructure may result in the periodic removal of emergent vegetation, growing in canals and drains, that provides Yuma clapper rail habitat. Up to 557 miles of canals and drains that could support patches of emergent vegetation could be subject to periodic maintenance activities that would remove emergent vegetation over the term of the LCR MSCP. As described in Section 5.2.1.3, it is unlikely that maintenance of canals would measurably affect the extent of species habitat. Periodic maintenance of the 244 miles of drains in the LCR MSCP planning area, however, could result in the removal of up to 30 acres of emergent vegetation that could provide habitat.

Operation of law enforcement patrol boats to enforce no-wake zone regulations that protect habitat (e.g., the Bill Williams Delta) would generate boat wakes in the no-wake zones for short periods in which other watercraft are being pursued. During the breeding season, boat wakes could swamp nests, potentially resulting in mortality of eggs or nestlings. Because of the low frequency with which such incidents occur (AGFD estimates that 150–200 person-days are expended annually enforcing no-wake zone regulations and NDOW estimates that 25–30 person-days are annually expended operating watercraft in sensitive off-channel areas that could support habitat in the LCR MSCP planning area) and the shortness of periods in which patrol boats generate boat wakes in protected habitat (i.e., the period required to stop a boat), a low level of take is expected.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the Yuma clapper rail.

5.6.2 Southwestern Willow Flycatcher

Proposed activities related to habitat restoration and maintenance projects and facilities and infrastructure maintenance in the LCR MSCP planning area may result in take of southwestern willow flycatcher. The likelihood of take is expected to increase over the term of the LCR MSCP if southwestern willow flycatchers become more abundant in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species.

Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary loss of habitat and harassment of individuals if individuals are present and activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that remove habitat to restore land cover types not used by southwestern willow flycatcher. The probability of permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing southwestern willow flycatcher habitat would be designed to maintain or improve its habitat, and it is unlikely that state fish and wildlife agencies would remove southwestern willow flycatcher habitat to restore habitat for other species. However, because habitat restoration sites have not yet been identified, it is assumed that up to 10 acres of degraded cottonwood-willow land cover that provides low-value habitat could be removed over the term of the LCR MSCP to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., dry patches of saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the southwestern willow flycatcher.

5.6.3 Desert Tortoise

Proposed activities related to habitat restoration and maintenance projects and facilities and infrastructure maintenance may result in take of desert tortoise. Restoration projects are not expected to be implemented in desert tortoise habitat or result in adverse modification of designated critical habitat because it is unlikely that the desert scrub communities the tortoise inhabits would be restored as aquatic, wetland, or riparian land cover. However, removal of relatively small amounts of habitat could be required if access roads and other infrastructure required to install and maintain restored habitats are constructed in desert tortoise habitat. The level of habitat removal is expected to be minimal and is not expected to result in harm (i.e., injury or mortality of individuals); therefore, it is not expected to result in take. Injury or mortality of individual tortoises

associated with implementing restoration projects, to the extent practicable, would be avoided. Over the term of the LCR MSCP, however, these activities (involving operation of vehicles and equipment in habitat) are expected to result in some low level of take.

Activities associated with maintaining facilities and infrastructure are generally expected to avoid effects on desert tortoise habitat. Over the term of the LCR MSCP, however, these activities (involving operation of vehicles and equipment in habitat) are expected to result in some low level of take of individuals. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the desert tortoise.

5.6.4 Bonytail

Covered activities related to construction and maintenance of fish attraction structures and navigation structures and stocking of nonnative fish species may result in take of bonytail in Reaches 2–5. Adverse effects of construction and maintenance activities on bonytail would be temporary, generally occurring during the period of construction. Construction and maintenance activities may temporarily increase turbidity and could cause sedimentation of spawning and rearing habitat. Sedimentation could suffocate eggs and larvae and temporarily reduce the production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect the survival, growth, and reproduction of bonytail. Although construction and maintenance activities could adversely affect bonytail and its habitat, the effects would be minimal. Implementation of these activities is expected to result in some low level of take over the term of the LCR MSCP. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the bonytail.

In addition to causing construction and maintenance effects on habitat, implementation of all non-flow-related covered activities could cause direct mortality or cause fish to temporarily avoid using affected habitat during periods of disturbance. Establishment of artificial habitat for nonnative fish species may result in take associated with increasing predation levels on bonytail by increasing local predator density.

Stocked nonnative species may prey on larvae and juvenile bonytail (assuming that bonytail larvae and juveniles are present). However, stocked rainbow trout are not expected to establish self-sustaining populations, and bonytail's temperature preference of near 75°F in their first year of life (Bulkley et al. 1981) is near the upper limit for survival of rainbow trout (Raleigh et al. 1984). There would be a low level of take.

5.6.5 Humpback Chub

Implementation of state non-flow-related covered activities will not affect humpback chub.

5.6.6 Razorback Sucker

Covered activities related to construction and maintenance of fish attraction structures and navigation structures and stocking of nonnative fish species may result in take of razorback sucker in Reaches 1–5. Adverse effects of construction and maintenance activities on razorback sucker would be temporary, generally occurring during the period of construction. Construction and maintenance activities could cause sedimentation of spawning and rearing habitat. Sedimentation could suffocate eggs and larvae and temporarily reduce the local production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect the survival, growth, and reproduction of razorback sucker. Although construction and maintenance activities could adversely affect razorback sucker and its habitat, the effects would be minimal because of the small extent of disturbance by these activities. Implementation of these activities is expected to result in some low level of take over the term of the LCR MSCP. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the razorback sucker.

In addition to causing construction and maintenance effects on habitat, implementation of non-flow-related covered activities could cause direct mortality or cause fish to temporarily avoid using affected habitat during periods of disturbance. Establishment of artificial habitat for nonnative fish species may result in take associated with increasing predation levels on razorback sucker by increasing local predator density.

Stocked nonnative fish species may prey on larvae and juvenile razorback sucker. However, stocked rainbow trout are not expected to establish self-sustaining populations, and their effects, compared to those of existing nonnative fish, are expected to be minimal. There would be a low level of take.

5.6.7 Western Red Bat

Proposed activities related to habitat restoration and maintenance projects along the LCR may result in take of western red bat. Disturbances associated with implementing covered activities (e.g., operation of equipment) could result in harassment of individuals if these activities are undertaken near roosts. However, habitat restoration projects would avoid removing cottonwood-willow types I and II and honey mesquite type III land cover that provide roosting habitat for this species to restore habitat for other species. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the western red bat.

5.6.8 Western Yellow Bat

Proposed activities related to habitat restoration and maintenance projects along the LCR may result in take of western yellow bat. Disturbances associated with implementing covered activities (e.g., operation of equipment) could result in harassment of individuals if these activities are undertaken near roosts. However, habitat restoration projects would

avoid removing cottonwood-willow types I and II and honey mesquite type III land cover that provide roosting habitat for this species to restore habitat for other species. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the western yellow bat.

5.6.9 Desert Pocket Mouse

Proposed activities related to habitat restoration and maintenance projects in Reaches 1–3 may result in take of desert pocket mouse if implemented in the species' habitat. Restoration-related activities undertaken in or near desert pocket mouse habitat, such as operation of equipment to remove vegetation, could result in temporary loss of habitat or harassment, injury, or mortality of individuals. However, habitat restoration projects would avoid removing desert pocket mouse habitat to restore habitat for other species; therefore, effects on habitat associated with these projects would be temporary. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the desert pocket mouse.

5.6.10 Colorado River Cotton Rat

Proposed activities related to habitat restoration and maintenance projects along the LCR in Reaches 3 and 4 may result in take of Colorado River cotton rat. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary or permanent loss of habitat or harassment, injury, or mortality of individuals. Effects on habitat would be temporary for restoration projects that restore or improve existing Colorado River cotton rat habitat. Because habitat restoration sites have not yet been identified, it is assumed that up to 5 acres of degraded or former marsh that provides low-value habitat in Reaches 3 and 4 could be removed over the term of the LCR MSCP to restore habitat for other species. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the Colorado River cotton rat.

5.6.11 Yuma Hispid Cotton Rat

Proposed activities related to habitat restoration and maintenance projects along the LCR in Reaches 6 and 7 may result in take of Yuma hispid cotton rat. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary or permanent loss of habitat or harassment, injury, or mortality of individuals. Effects on habitat would be temporary for restoration projects that improve existing Yuma hispid cotton rat habitat. Effects on habitat would be permanent for restoration projects that removed habitat to restore land cover types that are not used by the Yuma hispid cotton rat. The probability for permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing Yuma hispid cotton rat habitat will be designed to maintain or improve patches of cottonwood-willow that provide its habitat. However, because habitat restoration sites have not yet been identified, it is assumed that up to 5 acres of degraded cottonwood-willow land cover that provide low-

value habitat could be removed over the term of the LCR MSCP to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. This could result in a low level of take.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the Yuma hispid cotton rat.

5.6.12 Western Least Bittern

Proposed activities related to habitat restoration and maintenance projects, facilities and infrastructure maintenance, and operation of watercraft for law enforcement along the LCR may result in take of western least bittern. The likelihood of take is expected to increase over the term of the LCR MSCP if western least bittern becomes more abundant in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary or permanent loss of habitat or harassment, injury, or mortality of individuals. However, these activities would be conducted, to the extent practicable, when nesting adults and young birds are not present. Effects on habitat would be temporary for restoration projects that restore or improve existing western least bittern habitat. Because habitat restoration sites have not yet been identified, it is assumed that up to 10 acres of degraded or former marsh that provides low-quality habitat could be removed over the term of the LCR MSCP to restore habitat for other species.

Activities associated with maintaining facilities and infrastructure may result in the periodic removal of emergent vegetation, growing in canals and drains, that provides western least bittern habitat. Up to 557 miles of canals and drains that could support patches of emergent vegetation could be subject to periodic maintenance activities that would remove emergent vegetation over the term of the LCR MSCP. As described in Section 5.2.1.3, it is unlikely that maintenance of canals would measurably affect the extent of species habitat. Periodic maintenance of the 244 miles of drains in the LCR MSCP planning area, however, could result in the removal of up to 30 acres of emergent vegetation that could provide habitat.

Operation of law enforcement patrol boats to enforce no-wake zone regulations that protect habitat (e.g., the Bill Williams Delta) would generate boat wakes in the no-wake zones for short periods in which other watercraft are being pursued. During the breeding season, boat wakes could swamp nests, potentially resulting in mortality of eggs or nestlings. Because of the low frequency with which such incidents occur (AGFD estimates that 150–200 person-days are expended annually enforcing no-wake zone regulations and NDOW estimates that 25–30 person-days are annually expended operating watercraft in sensitive off-channel areas that could support habitat in the LCR MSCP planning area) and the shortness of periods in which patrol boats generate boat wakes in protected habitat (i.e., the period required to stop a boat), a low level of take is expected.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the western least bittern.

5.6.13 California Black Rail

Proposed activities related to habitat restoration and maintenance projects, facilities and infrastructure maintenance, and operation of watercraft for law enforcement along the LCR in or near habitat may result in take of California black rail. The likelihood of take is expected to increase over the term of the LCR MSCP if California black rail becomes more abundant in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary or permanent loss of habitat or harassment or mortality of individuals. However, these activities would be conducted, to the extent practicable, at times when nesting adults and young birds are not present. Effects on habitat would be temporary for restoration projects that restore or improve existing California black rail habitat. The probability of permanent loss of habitat is considered minimal because restoration projects undertaken in existing California black rail habitat would be designed to maintain or improve its habitat, and it is unlikely that state fish and wildlife agencies would remove California black rail habitat to restore habitat for other species. However, because habitat restoration sites have not yet been identified, it is assumed that up to 5 acres of degraded or former marsh that provides low-quality habitat could be removed over the term of the LCR MSCP to restore habitat for other species.

Activities associated with maintaining facilities and infrastructure may result in the periodic removal of emergent vegetation, growing in canals and drains, that provides California black rail habitat. Up to 557 miles of canals and drains that could support patches of emergent vegetation could be subject to periodic maintenance activities that would remove emergent vegetation over the term of the LCR MSCP. As described in Section 5.2.1.3, it is unlikely that maintenance of canals would measurably affect the extent of species habitat. Periodic maintenance of the 244 miles of drains in the LCR MSCP planning area, however, could result in the removal of up to 30 acres of emergent vegetation that could provide habitat.

Operation of law enforcement patrol boats to enforce no-wake zone regulations that protect habitat (e.g., the Bill Williams Delta) would generate boat wakes in the no-wake zones for short periods in which other watercraft are being pursued. During the breeding season, boat wakes could swamp nests, potentially resulting in mortality of eggs or nestlings. Because of the low frequency with which such incidents occur (AGFD estimates that 150–200 person-days are expended annually enforcing no-wake zone regulations and NDOW estimates that 25–30 person-days are annually expended operating watercraft in sensitive off-channel areas that could support habitat in the LCR MSCP planning area) and the shortness of periods in which patrol boats generate boat wakes in protected habitat (i.e., the period required to stop a boat), a low level of take is expected.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the California black rail.

5.6.14 Yellow-Billed Cuckoo

Proposed activities related to habitat restoration and maintenance projects along the LCR in the LCR MSCP planning area may result in take of the yellow-billed cuckoo. The likelihood of take is expected to increase over the term of the LCR MSCP if yellow-billed cuckoo becomes more abundant in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary loss of habitat or harassment of individuals if individuals are present and if activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that remove habitat to restore land cover types not used by yellow-billed cuckoo. The probability of permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing yellow-billed cuckoo habitat would be designed to maintain or improve its habitat, and it is unlikely that state fish and wildlife agencies would remove yellow-billed cuckoo habitat to restore habitat for other species. However, because habitat restoration sites have not yet been identified, it is assumed that up to 10 acres of degraded cottonwood-willow land cover that provides low-value habitat could be removed over the term of the LCR MSCP to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the yellow-billed cuckoo.

5.6.15 Elf Owl

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of elf owl. The likelihood of take is expected to increase over the term of the LCR MSCP if elf owl becomes more abundant in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary loss of habitat and harassment of individuals if individuals are present and if activities are undertaken during the breeding season. Habitat restoration projects would avoid removing cottonwood-willow types I and II and honey mesquite type III land cover that provide habitat for this species to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the elf owl.

5.6.16 Gilded Flicker

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of gilded flicker. The likelihood of take is expected to increase over the term of the LCR MSCP if gilded flicker becomes more abundant in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary loss of habitat and harassment of individuals if individuals are present and if activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that remove habitat to restore land cover types not used by gilded flicker. The probability of permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing gilded flicker habitat would be designed to maintain or improve its habitat, and it is unlikely that state fish and wildlife agencies would remove gilded flicker habitat to restore habitat for other species. However, because habitat restoration sites have not yet been identified, it is assumed that up to 10 acres of degraded cottonwood-willow land cover that provides low-value habitat could be removed over the term of the LCR MSCP to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the gilded flicker.

5.6.17 Gila Woodpecker

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of Gila woodpecker. The likelihood of take is expected to increase over the term of the LCR MSCP if Gila woodpecker becomes more abundant in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary loss of habitat and harassment of individuals if individuals are present and if activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that remove habitat to restore land cover types not used by Gila woodpecker. The probability of permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing Gila woodpecker habitat would be designed to maintain or improve its habitat, and it is unlikely that state fish and wildlife agencies would remove Gila woodpecker habitat to restore habitat for other species. However, because habitat restoration sites have not yet been identified, it is assumed that up to 10

acres of degraded cottonwood-willow land cover that provides low-value habitat could be removed over the term of the LCR MSCP to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the Gila woodpecker.

5.6.18 Vermilion Flycatcher

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of vermilion flycatcher. The likelihood of take is expected to increase over the term of the LCR MSCP if vermilion flycatcher becomes more abundant in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary loss of habitat and harassment of individuals if individuals are present and activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that remove habitat to restore land cover types not used by vermilion flycatcher. The probability of permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing vermilion flycatcher habitat would be designed to maintain or improve its habitat, and it is unlikely that state fish and wildlife agencies would remove vermilion flycatcher habitat to restore habitat for other species. However, because habitat restoration sites have not yet been identified, it is assumed that up to 10 acres of degraded cottonwood-willow land cover that provides low-value habitat could be removed over the term of the LCR MSCP to restore habitat for other species. Habitat restoration projects would avoid removing honey mesquite type III that provides habitat for this species to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the vermilion flycatcher.

5.6.19 Arizona Bell's Vireo

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of Arizona Bell's vireo. The likelihood of take is expected to increase over the term of the LCR MSCP if Arizona Bell's vireo becomes

more abundant in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary loss of habitat and harassment of individuals if individuals are present and if activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that remove habitat to restore land cover types not used by Arizona Bell's vireo. The probability of permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing Arizona Bell's vireo habitat would be designed to maintain or improve its habitat, and it is unlikely that state fish and wildlife agencies would remove Arizona Bell's vireo habitat to restore habitat for other species. However, because habitat restoration sites have not yet been identified, it is assumed that up to 20 acres of degraded cottonwood-willow and honey mesquite type IV land cover that provide low-value habitat could be removed over the term of the LCR MSCP to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the Arizona Bell's vireo.

5.6.20 Sonoran Yellow Warbler

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of the Sonoran yellow warbler. The likelihood of take is expected to increase over the term of the LCR MSCP if Sonoran yellow warbler becomes more abundant in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary loss of habitat and harassment of individuals if individuals are present and if activities are undertaken during the breeding season. Effects on habitat would be permanent for restoration projects that remove habitat to restore land cover types not used by Sonoran yellow warbler. The probability of permanent loss of habitat is considered minimal because riparian restoration maintenance projects undertaken in existing Sonoran yellow warbler habitat would be designed to maintain or improve its habitat, and it is unlikely that state fish and wildlife agencies would remove Sonoran yellow warbler habitat to restore habitat for other species. However, because habitat restoration sites have not yet been identified, it is assumed that up to 10 acres of degraded cottonwood-willow land cover that provides low-value habitat could be removed over the term of the LCR MSCP to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., dry patches of saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP

HCP Chapter 5), however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the Sonoran yellow warbler.

5.6.21 Summer Tanager

Proposed activities related to habitat restoration and maintenance projects in the LCR MSCP planning area may result in take of summer tanager. The likelihood of take is expected to increase over the term of the LCR MSCP if summer tanager becomes more abundant in the LCR MSCP planning area as a result of implementing LCR MSCP conservation measures for this species. Restoration-related activities, such as operation of equipment to remove vegetation, could result in temporary loss of habitat and harassment of individuals if individuals are present and if activities are undertaken during the breeding season. Habitat restoration projects would avoid removing cottonwood-willow types I and II land cover that provide habitat for this species to restore habitat for other species. Some land cover types that are not considered to be species' habitat, but that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals, could also be restored as habitat for other species. Implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), however, will reduce the likelihood for incidental take of that could be associated with removal of these land cover types.

Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the summer tanager.

5.6.22 Flat-Tailed Horned Lizard

Maintaining and replacing facilities and infrastructure could result in take of flat-tailed horned lizard. Operation of vehicles and equipment necessary to conduct these activities along and near roads in flat-tailed horned lizard habitat may result in harassment and mortality of individuals. These activities, therefore, could result in a low level of take over the term of the LCR MSCP.

Habitat restoration and maintenance projects are not expected to affect the desert scrub communities inhabited by flat-tailed horned lizard because it is unlikely that the desert scrub communities it inhabits will be restored as aquatic, wetland, or riparian land cover. However, removal of relatively small amounts of habitat could be required if access roads and other infrastructure required to install and maintain restored habitats are constructed in flat-tailed horned lizard habitat. Nevertheless, the level of habitat removal is expected to be minimal and is not expected to result in harm (i.e., injury or mortality of individuals); therefore, it not expected to result in take. However, over the term of the LCR MSCP, operation of vehicles and equipment in habitat is expected to result in some low level of take. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the flat-tailed horned lizard.

5.6.23 Relict Leopard Frog

Wetland restoration projects in the LCR MSCP planning area may result in take of the relict leopard frog if undertaken in occupied habitat. Restoration-related activities designed to benefit the species, such as controlling nonnative predators/competitors or increasing the size of occupied springs, could result in an unquantifiable temporary loss of habitat and harassment, injury, or mortality of individuals. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the relict leopard frog.

5.6.24 Flannelmouth Sucker

Covered activities related to construction and maintenance of fish attraction structures and navigation structures, as well as stocking of nonnative fish species, may result in take of flannelmouth sucker in Reach 3. Adverse effects of construction and maintenance activities on flannelmouth sucker would be temporary, generally occurring during the period of construction. Construction and maintenance activities may temporarily increase turbidity and could cause sedimentation of spawning and rearing habitat. Sedimentation could suffocate eggs and larvae and temporarily reduce the production and availability of food organisms. Contaminants accidentally discharged or suspended with disturbed sediments could adversely affect the survival, growth, and reproduction of flannelmouth sucker. Although construction and maintenance activities could adversely affect flannelmouth sucker and its habitat, the effects would be minimal. Implementation of these activities is expected to result in some low level of take over the term of the LCR MSCP. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the flannelmouth sucker.

In addition to causing construction and maintenance effects on habitat, implementation of all covered activities could cause direct mortality or cause fish to temporarily avoid using affected habitat during periods of disturbance. Establishment of artificial habitat for nonnative fish species may result in take associated with increasing predation levels on flannelmouth sucker by increasing local predator density. Stocked nonnative species may prey on larvae and juvenile flannelmouth, compete for food organisms, or alter foodweb dynamics. However, stocked rainbow trout are not expected to establish self-sustaining populations, and their effects, compared to current nonnative fish interactions, are expected to be minimal. There would be a low level of take.

5.6.25 MacNeill's Sootywing Skipper

Restoration-related covered activities will, to the extent practicable, avoid removal of MacNeill's sootywing skipper habitat. These activities, however, may result in some low level of disturbance or loss of habitat over the term of the LCR MSCP. Restoration-related activities associated with operation of equipment near existing populations may result in direct take of individuals. Implementation of non-Federal ongoing non-flow-related covered activities are not expected to result in indirect effects on the MacNeill's sootywing skipper.

5.6.26 Sticky Buckwheat

Implementation of state non-flow-related covered activities will not affect sticky buckwheat.

5.6.27 Threecorner Milkvetch

Implementation of state non-flow-related covered activities will not affect threecorner milkvetch.

5.6.28 Impacts on Evaluation Species

5.6.28.1 California Leaf-Nosed Bat

Implementation of state non-flow-related covered activities are not expected to affect California leaf-nosed bat.

5.6.28.2 Pale Townsend's Big-Eared Bat

Implementation of state non-flow-related covered activities are not expected to affect pale Townsend's big-eared bat.

5.6.28.3 Colorado River Toad

Because the Colorado River toad is not present in the LCR MSCP planning area, implementation of state non-flow-related covered activities will not affect Colorado River toad.

5.6.28.4 Lowland Leopard Frog

Because the lowland leopard frog is not present in the LCR MSCP planning area, implementation of state non-flow-related covered activities will not affect lowland leopard frog.

5.7 Effects of Federal Actions on the Bald Eagle

Flow-related and non-flow-related covered activities are not expected to affect the food resources, foraging opportunities, or nesting habitat of the bald eagle within the LCR MSCP planning area. Operation of equipment to implement non-flow-related covered activities (e.g., implementation of channel, desilting basin, boat ramp, gage station, and

other facility maintenance activities; implementation of marsh and riparian restoration projects; conversion of lands to agriculture) could result in temporary harassment of foraging or roosting individuals if individuals are present when such activities are implemented. Wintering birds, however, are expected to continue using the river and most likely will congregate where food resources are plentiful and excessive disturbance from recreation can be avoided. Implementation of the covered activities and the LCR MSCP may affect, but unlikely to adversely affect the bald eagle.

5.8 Interrelated and Interdependent Actions

Interrelated actions are those actions that are part of the larger proposed action and that depend on the proposed action for their justification (50 C.F.R. §402.02). Interdependent actions are actions that have no independent utility apart from the proposed action (50 C.F.R. §402.02). The Federal action agencies have not found any actions that qualify as interrelated or interdependent to the Federal proposed actions covered in the LCR MSCP BA.

5.9 Net Effect of Actions under Consultation

Table 5-7 summarizes the effects on covered and evaluation species habitat of implementing the flow-related and non-flow-related covered activities and the LCR MSCP Conservation Plan covered activities described in Chapter 2, "Description of Federal Actions (Covered Actions)," and non-federal non-flow-related covered activities described in Chapter 3, "Non-Federal Discretionary Covered Activities: Ongoing and Future."

5.10 Indirect Effects outside the Planning Area

The prior sections in Chapter 5 address the effects, both direct and indirect, of the covered activities within the LCR MSCP planning area. A separate issue that has been raised is whether the covered activities that involve the delivery of water from the Colorado River affect listed species within service areas outside the LCR MSCP planning area by causing growth and development. This section addresses the potential for those indirect effects. The ESA regulations define indirect effects as effects that are caused by a proposed action and are later in time, but still are reasonably certain to occur (50 C.F.R. §402.02). The first issue to be examined under this definition is that of causation. The second issue to examine is whether any causal effects are reasonably certain to occur. Indirect effects exist only if both causation and reasonable certainty of occurrence are found.

5.10.1 Causation

The ESA regulations provide that a Federal proposed action must assess effects that are caused by the proposed action. The issue of causation is a fact-intensive inquiry that addresses close issues of proximity and degree. The ESA regulations do not provide guidance on the nature of the causal inquiry to be conducted. Similarly, ESA case law concerning indirect effects and the issue of causation is rare, with no real guidance issuing from the courts in the past 15 years. The older ESA cases that addressed the issue of causation did not directly address what the test for causation should be or how it should be applied to complex factual situations of the type presented by the LCR MSCP (See e.g., *National Wildlife Federation v. Coleman*, 529 F.2d 359 [5th Circuit], cert. denied, 429 U.S. 979 (1976), *Riverside Irrigation District v. Andrews*, 758 F.2d 508 [10th Circuit 1985]).

The regulatory language that defines indirect effects and incorporates the concept of causation under the ESA is the same framework used under NEPA. In both cases, the causal test is established by the simple phrase "indirect effects are caused by the action" (40 C.F.R. §1508.8(b) and 50 C.F.R. §402.02). NEPA and the ESA thus appear to have the same test for causation. Under NEPA, recently issued judicial opinions have provided significant guidance on how to conduct the causal analysis. These decisions address complex fact patterns that are comparable to the issue addressed in this section. The LCR MSCP participants have reviewed the analysis provided in these cases for use in developing the indirect effects analysis set forth below. The following guidance provided by the courts in the context of NEPA has been considered in performing the indirect effects analysis conducted for the LCR MSCP.

The Ninth Circuit has held that an effect is caused by an action if the action is an "indispensable prerequisite" or an "essential catalyst" to the effects. *City of Davis v. Coleman*, 521 F.2d 661, 674 (9th Circuit 1975). In contrast, it is not enough that the actions might be related or that each "might benefit from the other's presence." *Sylvester v. U.S. Army Corps of Engineers*, 884 F.2d 394 (9th Circuit 1989). Similarly, it is not enough if a proposed action "may induce limited additional development" when "the existing development necessitated the [action]." (*City of Carmel by-the-Sea v. DOT*, 123 F.3d 1142 [9th Circuit 1997]) In *City of Carmel by-the-Sea*, the Ninth Circuit upheld an analysis that stated that the proposed project "had the potential to facilitate growth" but would not ultimately do so because of the development constraints imposed by local authorities. Similarly, in a case involving an airport expansion project designed to address existing levels of air traffic, the Ninth Circuit rejected the argument that airport expansion removed a constraint to growth because without the project, growth could not occur safely. The Ninth Circuit stated, "the fact that it might also facilitate further growth is insufficient to constitute a growth-inducing impact …." *Morongo Band of Mission Indians v. Federal Aviation Administration*, 161 F.3d 569 (9th Circuit 1998).

In a recent example of the application of the causal analysis to a complex fact pattern, the court in *Border Power Plant Working Group v. Dept. of Energy*, (2003 WL 21037927 [S.D. Cal.]), followed the analysis established by *Sylvester, City of Carmel by-the-Sea*, and *Morongo*. The court found that authorization of a power transmission line on the U.S./Mexico border did not require analysis of emissions from a Mexican power plant that could use the new line to transmit power to the United States. The court held that the

Table 5-7. Comparison of Species-Specific Habitat Impacts to Created LCR MSCP Habitat

Covered Species	Impacts of Federal and Non-Federal Flow-Related Covered Activities[a]	Impacts of Federal and Non-Federal Non-Flow-Related Covered Activities[a]	Total Impacts	LCR MSCP Created Habitat
Threatened and Endangered Species				
Yuma clapper rail	133	110	243	512
Southwestern willow flycatcher	1,784	69	1,853	4,050
Desert tortoise (Mojave population)	0	192	192	0[b]
Bonytail	399	0	399	360[c]
Humpback chub	ND[d]	0	ND[d]	ND[d]
Razorback sucker	399	0	399	360[c]
Other Covered Species				
Western red bat (roosting habitat)	161	604	765	765
Western yellow bat (roosting habitat)	161	604	765	765
Desert pocket mouse	0	0	0	0
Colorado River cotton rat	59	8	67	125
Yuma hispid cotton rat	0	71	71	76
Western least bittern	133	110	243	512
California black rail	37	66	103	130
Yellow-billed cuckoo	1,425	109	1,534	4,050
Elf owl	161	590	751	1,784
Gilded flicker	1,425	109	1,534	4,050
Gila woodpecker	819	36	855	1,702
Vermilion flycatcher	1,890	724	2,614	5,208
Arizona Bell's vireo	1,654	1,329[e]	2,983[e]	2,983
Sonoran yellow warbler	2,929	193	3,122	4,050
Summer tanager	161	14	175	602
Flat-tailed horned lizard	0	128	128	0[f]
Relict leopard frog	0[g]	0[g]	0[g]	0[g]
Flannelmouth sucker	85	0	85	85
MacNeill's sootywing skipper	172	50	222	222
Sticky buckwheat	ND[h]	0	ND[h]	ND[h]
Threecorner milkvetch	ND[h]	0	ND[h]	ND[h]
Evaluation Species				
California leaf-nosed bat (roosting habitat)	0	0	0	0
Pale Townsend's big-eared bat (roosting habitat)	0	0	0	0
Colorado River toad	0	0	0	0
Lowland leopard frog	0	0	0	0

Note: LCR MSCP conservation measures to create habitat for covered species will avoid removal of cottonwood-willow, honey mesquite, marsh, and backwater land cover types that provide habitat for covered species, and, therefore, impacts of implementing the LCR MSCP conservation measures are not shown in this table. The LCR MSCP currently estimates that about two-thirds of LCR MSCP created habitat would be created on agricultural lands (5,045 acres), including associated infrastructure (estimated to be 1% of all habitat created, or 81 acres). Agricultural lands provide little or no habitat value for covered and evaluation species.

The LCR MSCP impact assessment also assumes that up to 512 acres of existing degraded or former marsh that may provide low-value habitat could be converted to create fully functioning marsh that provides high-value Yuma clapper rail, western least bittern, California black rail, and Colorado River cotton rat habitat. Up to 360 acres of existing degraded or former backwaters could also be converted to create fully functioning backwaters that provides high-value habitat for the bonytail, razorback sucker, and flannelmouth sucker. Conversion of existing degraded or former marsh and backwaters to create habitat for these species, however, will not result in a loss of existing habitat.

The remainder of LCR MSCP habitat (currently estimated to be 2,377 acres) would be created on additional lands that may support some transitory or minor level of use (e.g., saltcedar and saltcedar-dominated land cover types) by individuals of one or more covered species, but are not considered to be habitat . These land cover types would be lost and replaced with habitats designed to be of higher value for the covered species. With implementation of the avoidance and minimization measures described in the LCR MSCP Conservation Plan (see LCR MSCP HCP Chapter 5), removal of these low-quality habitats, however, is not expected to result in harm (i.e., injury or mortality of individuals) and, therefore, is not expected to result in take of covered or evaluation species.

[a] From Table 5-5.

[b] Net loss in habitat is fully mitigated by protecting 230 acres of desert tortoise habitat in accordance with mitigation requirements in the document entitle “Compensation for Desert Tortoise” (Desert Tortoise Compensation Team 1991).

[c] The effects of the loss of 399 acres of backwater on this species is fully mitigated by both creating 360 acres of backwater that will be managed to provide greater habitat values for this species and by stocking juvenile fish to substantially augment the existing population over the term of the LCR MSCP.

[d] ND = Not determined. Acres of potentially affected habitat are not calculated. Changes in reservoir elevations associated with implementation of flow-related covered activities, however, could result in the establishment of up to 62 miles of transitory Colorado River channel when the reservoir pool is maintained at lower elevations that could be occupied by humpback chub and subsequently lost when reservoir elevations rise.

[e] Includes 610 acres of honey mesquite IV that provides Arizona Bell’s vireo habitat that could be converted to agricultural uses and that are covered under the LCR MSCP. Up to an additional 3,832 acres of honey mesquite IV that provides habitat could be removed by Federal non-flow-related activities, however, these activities and resultant impacts are not covered under the LCR MSCP.

[f] Net loss in habitat is fully mitigated by protecting 230 acres of flat-tailed horned lizard habitat in accordance with mitigation requirements in the Flat-Tailed Horned Lizard Rangewide Management Strategy (Foreman 1997).

[g] Implementation of covered activities will not result in removal of this species habitat but could result in temporary disturbance of habitat or affect movement of individuals.

[h] ND = Not determined. Acres of potentially affected habitat are not calculated. Changes in Lake Mead reservoir elevations associated with implementation of flow-related covered activities, however, would result in periodic loss of habitat that is exposed along the Lake Mead shoreline when reservoir elevations are low and then is subsequently inundated when reservoir elevations rise.

turbines in the plant dedicated to production of power for Mexico were not causally linked to the new transmission line "in a way that makes the Baja California Power line a necessary prerequisite or essential catalyst to their operation." The court further noted that "because the line of causation is too attenuated between these turbines and the Federal action permitting the Baja California Power line, Ninth Circuit authority makes clear that the emissions of the non-export turbines were not effects of the Baja California Power line and that the Federal defendants were therefore under no NEPA obligation to analyze their emissions as effects of the action." The court also found that because the turbine in the plant that was dedicated to the export of power had an alternate route, the Baja California Power line could not be considered the but-for cause of the export turbine's operation and effects from the operation of the turbine were therefore not indirect effects of the Baja California Power line.

Based on existing judicial guidance, relevant factors in the causal analysis concerning growth-inducement include whether the action is the sole cause, whether the action has a useful purpose other than serving new growth, whether the action is intended to induce growth or to address existing levels of demand, and whether growth is being regulated at the local level. The test embraced by the courts demonstrates a pragmatic approach that recognizes there must be a stopping point in any causal analysis.

5.10.2 Reasonably Certain to Occur

If it is determined that a proposed action has the potential to cause indirect effects, then an analysis must be conducted to determine whether any of the potential indirect effects are reasonably certain to occur. The term "reasonably certain to occur" is narrower than the "reasonably foreseeable" standard used under NEPA. The term "reasonably certain to occur" was selected by the USFWS to eliminate speculation concerning future actions (51 FR 19926, 19933 [June 3, 1986]). In order for an action to be reasonably certain to occur, "there must exist more than a mere possibility that the action may proceed." (*Id*.) Factors to be considered to determine whether a proposed action is reasonably certain to occur include the economic, administrative, and legal hurdles remaining, as evidenced by work plans, appropriations, and pending or issued permits. (*Endangered Species Consultation Handbook*, p. 4-28, U.S. Fish and Wildlife Service 1998.) According to the Service, "the more State, tribal or local administrative discretion remaining to be exercised before a proposed … action can proceed, the less there is reasonable certainty the project will be authorized." (*Id*. at p. 4-30.)

5.10.3 Current and Continuing Operations

The covered activities include the continuation of water diversions from the LCR at existing levels and through existing diversion facilities as described in Chapters 2 and 3. Ongoing diversions of LCR water are delivered for a variety of uses, including agriculture, housing, commercial and industrial facilities. The geographic areas outside the LCR MSCP planning area that are serviced by LCR water include the Imperial and Coachella Valleys and the coastal plain of southern California, Clark County in southern Nevada, and parts of Arizona served by the CAP.

5.10.3.1 Causation

In the case of the LCR MSCP, the issue of causation is two-tiered. First, whether the continued operation of existing facilities for delivery of LCR water to service areas outside the LCR MSCP planning area causes growth and development in the service areas, and second, whether that growth and development will cause the incidental take of listed species. This subsection examines the factual circumstances of the LCR MSCP that are relevant to causation.

The factors that cause growth are mainly economic, especially job availability, but also include the availability and quality of housing, levels of foreign immigration, and even the weather (see *City Growth and the 2000 Census: Which Places Grew, and Why*, Glaeser and Shapiro 2001). Throughout the United States, growth has occurred even as overall water use has leveled off and even declined (Gleick 2003).

Water supply has not been a cause of growth in areas served with LCR water. For example, data for the San Diego region of southern California, which receives LCR water, suggests that the water supply has had little to no influence on growth. The population of the San Diego region has fluctuated extensively over the past two decades in response to economic factors such as employment availability. In 1993, the population in the San Diego region declined dramatically, reaching 1972 levels; the region is only now beginning to return to 1989 population levels. (San Diego Association of Governments 1999). These fluctuations occurred despite the existence of the same water availability for the past two decades. (see *Regional Urban Water Management Plan*, pp. I-4 to I-11, Metropolitan Water District of Southern California 2000).

An additional factor to consider in the analysis of the effect of the delivery of LCR water on growth and development is the availability of other sources of water supply. The availability of multiple sources of water supply means that no individual source is "indispensable" or "essential" to the area served. There are, within the areas served by LCR water, other existing and potential sources of water. For example, the Metropolitan Water District of Southern California has identified a portfolio of diversified supplies for its service area in addition to LCR water, including the California State Water Project, groundwater and surface storage, recycling and conservation, and desalination. (*Regional Urban Water Management Plan* [Metropolitan Water District of Southern California 2000] and *Report on Metropolitan's Water Supplies* [Metropolitan Water District of Southern California 2003]).

The second issue related to causation is whether the growth within areas served by LCR water will cause the take of protected species. As with the first issue, there is no basis for a causal connection between the delivery of water and incidental take by new development. Growth does not result in the take of species if the new development occurs in areas that do not contain listed species or their habitats. For that reason, urban infill and increased housing density does not cause take of protected species. Infill development, sometimes referred to as "smart growth," is currently occurring in the areas served by LCR water. In San Diego, for example, thousands of residential units are being added to the downtown area. The city is also creating a "City of Villages" concept that emphasizes urban infill and increased density and is designed to meet the demand for 89,000 new housing units through 2020 (Jackson 2002), providing an example that substantial new growth can occur in service areas without adversely affecting existing

habitat areas. The causal factor for any incidental take that results from new development is the decision regarding where the development will occur. Those decisions reside in the jurisdiction of government agencies with land use authority, not with water agencies.

The ESA prohibits unauthorized impacts on listed species through habitat destruction. The USFWS, through the HCP permitting process under the ESA, is playing a central role in determining where and to what extent development can affect listed species in areas served by LCR water. If an area already has incidental take authorizations, then delivery of LCR water into that area cannot cause impacts on species in violation of the ESA. State and local government agencies are also responsible for regulating and approving new development in these areas. The level of separate regulatory approvals required for any new development within the service areas is substantial. Federal, state, and local government agencies other than water agencies control the extent and location of growth and development. Endangered and threatened species habitat, in particular, is being closely protected by regulatory agencies with the authority to enforce compliance with state and Federal endangered species laws and to permit the incidental take of listed species within the service areas. As described in Section 5.10.3.2, below, significant portions of the service areas have engaged in regional permitting under the ESA, and any impacts on listed species from new development within those areas are authorized by, and subject to the restrictions and mitigation obligations contained in, those permits.

The delivery of LCR water is an activity of a type that the courts have indicated do not cause indirect effects. The continued delivery of water through existing facilities will not cause unauthorized impacts on listed species in the areas served. The absence of any causal link is shown both by the reality that existing water supply is not the driving force behind growth in general, and growth in habitat areas in particular. Furthermore, there is no causation in cases such as this where the action involves the ongoing delivery of water through existing infrastructure into service areas that use multiple sources of water and where growth that does occur is regulated by land use and regulatory agencies to ensure compliance with ESA.

5.10.3.2 Reasonably Certain to Occur

This subsection describes the factors that are relevant in determining whether effects on listed species are reasonably certain to occur as a result of delivery of LCR water in the service areas. Relevant factors include the long-term nature of the LCR MSCP, the trends toward urban infill, increased density, urban renewal, and the advent of regional habitat conservation planning under the ESA.

The term of the LCR MSCP authorization is expected to be from 2004 to 2054. As noted in Section 5.10.2, to meet the requirement for reasonable certainty, there should be evidence of work plans, appropriations, or approvals for those actions. The more administrative and legal hurdles that remain for approval of an action, the less certain it is that the action will occur. It would be mere speculation to identify where specific development will occur within areas served by LCR water. Even assuming for purposes of this analysis that a causal relationship between water delivery and actions that modify habitat in service areas could be established, the requirement for reasonable certainty

cannot be met in this instance. Conversely, even if it is found that the take of listed species is reasonably certain to occur as a result of identifiable future development, there is no causal linkage between the development and the supply of LCR water.

Population trend data forecasts growth during the 50-year term of the LCR MSCP, but trend data is only a generalized forecast directed at rates of growth. Trend data is particularly unhelpful with regard to the central inquiry involved here, which is whether future growth will cause the incidental take of protected species or habitat. As discussed in Section 5.10.3.1, the water service areas at issue are able to accommodate extensive growth in non-habitat areas without infringing on protected species. In addition, some existing outdated development will be removed to make way for new growth as part of the urban renewal trend.

More importantly, any new development that may cause the take of a listed species is subject to the regulatory controls of land use and resource agencies. Any conclusion that new development is reasonably certain to cause the take of species must be based on the assumption that these agencies will fail to comply with the requirements of the ESA. On the contrary, the record reflects general compliance with the ESA. The existence of regional HCPs in areas served by LCR water indicate that it is reasonably certain future projects will avoid and mitigate for impacts on protected species and critical habitat in a manner that is reviewed and approved by the USFWS. The development of conservation plans for geographic regions ensures compliance with the ESA for any growth that may occur within that region. As a result, the effects of such projects are not reasonably certain to adversely affect protected species and critical habitat in a manner that is not already authorized.

In California, regional habitat conservation plans have been developed or are planned for most of the water service areas that include protected species and their habitat. Existing HCPs cover regions within Orange, Riverside, and San Diego Counties (Western Riverside County MSHCP, Orange County Central-Coastal MSCP, San Diego MSCP). Additional MSHCPs are pending approval for other parts of Orange, San Diego, and Imperial Counties (San Diego MSHCP, Orange County Southern MSHCP, Coachella Valley MSHCP). These HCPs provide authorization for specific levels of incidental take that may occur through new development within those regions. The USFWS has the authority to enforce the measures contained in the permits issued in relation to these regional plans and the plans themselves require annual compliance monitoring. Therefore, unauthorized impacts on protected species are not reasonably certain to occur as a result of LCR water deliveries within these service areas. The following excerpt from an annual report for the San Diego MSCP is an example of full compliance and strict control over actions within the area covered by the HCP:

> In 2001, 111 new development projects were reviewed by the MSCP staff for consistency with the adopted MSCP Subarea Plan and implementing regulations. Since January 2002, an additional 109 new development projects have been reviewed. City staff continues to ensure that the MHPA [Multi-Habitat Planning Area] preserve design, land use adjacency guidelines, mitigation requirements and specific area management directives have been evaluated and, as appropriate, incorporated into project designs.(Page 4, 2002 MSCP Annual Public Workshop- Summary Report [City of San Diego 2002]).

In Nevada, LCR water is delivered within Clark County. The county has completed a long-term MSHCP and received a section 10 permit authorizing impacts on threatened and endangered species on a countywide basis (Clark County MSHCP). Impacts on listed species that are not already authorized by the section 10 permit are not expected. The Clark County MSHCP closely tracks all land disturbance authorized and the conservation revenue that is generated from it. (Clark County MSHCP Biennium Progress Report for 1999–2001, page 108 [Clark County 2002]).

In Arizona, water deliveries outside the LCR MSCP planning area occur through the CAP. There have been more than 40 section 7 consultations involving the CAP. The effects of water deliveries via CAP have been analyzed and authorized in these section 7 consultations. The indirect effects associated with water deliveries via CAP have thus already been addressed.

In light of the evidence of the widespread use of regional HCPs in areas served by LCR water, it is reasonably certain that any new development in these areas will not result in the unauthorized take of listed species. Similarly, growth that occurs in areas without listed species or their habitat will not cause effects to those species. As a result, unauthorized impacts on protected species and habitat outside the LCR planning area are not reasonably certain to occur.

5.10.4 Future Covered Activities

The covered activities include possible future changes in points of delivery and diversion in an amount that could total up to 1.574 mafy of LCR water. These changes in points of delivery and diversion would result from water transfers, other similar actions, and administrative actions implemented by Reclamation as described in Chapters 2 and 3. For the reasons stated in Section 5.10.3, above, the diversion and delivery of water to service areas outside the LCR MSCP planning area will not cause any identifiable indirect effects to listed species. When the projects or agreements are proposed in the future, the Secretary of the Interior, acting as watermaster, may consult with the USFWS to determine whether there are any other indirect effects.

5.10.5 Conservation Actions

Implementation of the LCR MSCP Conservation Plan is not expected to cause any indirect effects outside of the LCR MSCP planning area.